FEBRUARY 1961 / 50¢

AIR FORCE

and SPACE DIGEST

The Magazine of Aerospace Power / Published by the Air Force Association

FIFTEENTH ANNIVERSARY

FEBRUARY 4, 1946 • FEBRUARY 4, 1961

"We band ourselves together . . .
for the defense and protection
of our national heritage as free men."

—From the Preamble to the National Constitution of the Air Force Association.

STATE
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1961

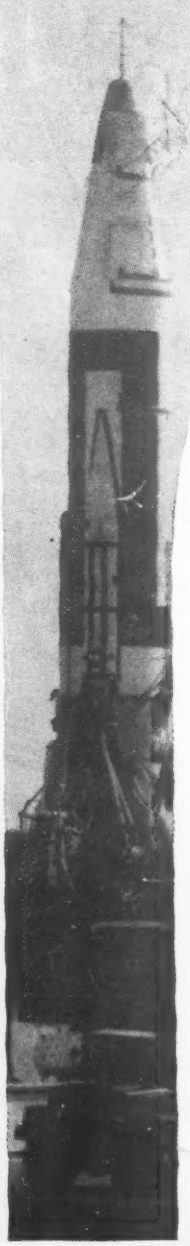
RELIABLE HUSKIE... WELCOME SIGHT IN MISSILE SUPPORT

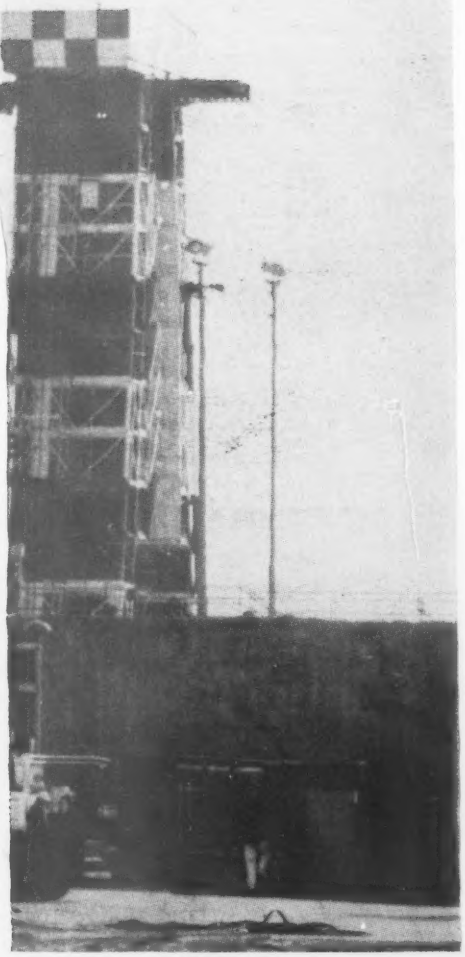
The kind of support a missile site may need in an emergency may be technicians, equipment, liaison or surveillance.

Regardless of weather, when support is needed, it is critical and it must be fast and reliable.

In its support missions, the Kaman HUSKIE can carry precious cargo inside, bulk cargo outside.

Built by the people who pioneered turbine powered helicopters, the HUSKIE, already on duty with the Air Force all over the world, has the reliability, capacity, and versatility to become the vital link in the chain of missile site support.





pioneers in turbine powered helicopters

THE KAMAN AIRCRAFT CORPORATION • BLOOMFIELD, CONN.

EXPANDABLE STRUCTURES: Another prime capability of Goodyear Aircraft

Way station to the stars, GAC-designed space structure, with solar collector and communications antenna, is completely expandable.

HOUSING PROJECTS 500 MILES UP!

Expandable fabric structures for space missions inherently provide the advantages of minimum structural density, maximum volume/weight ratio, unmatched packageability on boost – making possible full-size erection and deployment in space with minimum launch penalty.

Expandable structures are being applied to a wide range of space applications – from manned space stations and ultra-lightweight solar concentrators to re-entry vehicles where aerospace engineers are applying new high-temperature, high-strength fabrics.

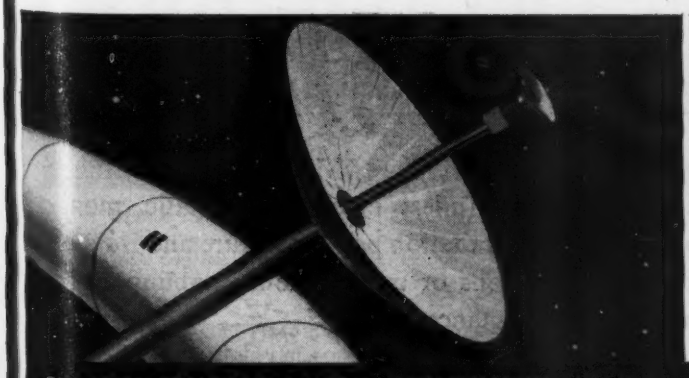
With 50 years of practical experience in developing specialized fabrics and fabric structures, Goodyear Aircraft is in a unique position to put this new technology to work at once. Whether the need is for a complete space system or major subsystems, GAC stands ready to utilize its unequaled facilities – research, engineering and production. If this new approach will help your project get off the ground, write Goodyear Aircraft Corporation, Dept. 914 VB, Akron 15, Ohio.

GOODYEAR

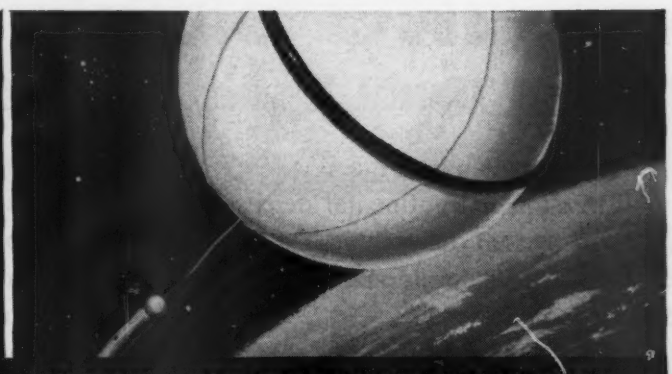
Plants in Akron, Ohio, and Litchfield Park, Arizona

GOODYEAR AIRCRAFT CORPORATION

Promising careers for experienced engineers interested in astronautics.



Solar concentrator with new "trumpet" condenser expands to 44½-ft. diameter. Design has been thoroughly tested for space environment.



Ballute recovery system, tested and proven in flight test, provides variable controlled drag for re-entry vehicle.

CREATIVE ELECTRONICS BY RCA

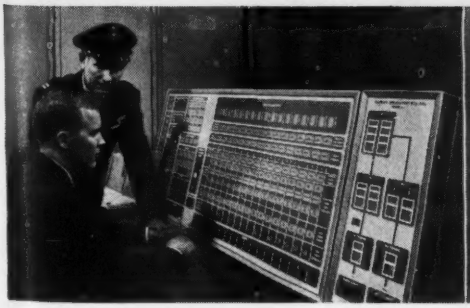
KEEPING BMEWS ON THE AIR

RCA Checkout and Automatic Monitoring Equipment Guards BMEWS Reliability Around the Clock

The incredible complexity of the BMEWS network and its vital mission in continental defense demand the ultimate in system reliability. Through unique and highly advanced developments by RCA this standard is being achieved.

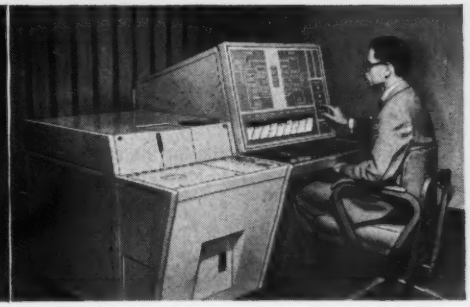
The RCA Checkout Equipment installed at BMEWS sites performs a dual function—it generates and inserts realistic simulated target problems for on line exercising of the entire system. These integrated tests are designed to test the BMEWS early warning capability to its fullest extent. Automatic monitoring detects degradation prior to failure and isolates marginal conditions or malfunctions enabling rapid corrective maintenance.

Around-the-clock operation of this RCA equipment enables BMEWS to meet its over-all operability goal with negligible downtime, thus keeping BMEWS on the air!



The Central Automatic Monitoring Console displays the status of the entire site, and displays equipment degradation prior to failure.

The Checkout Data Processor generates simulated missile attacks and evaluates the BMEWS response to the simulation.



The Automatic Monitoring Console displays degradation and the location of degraded equipment.

RCA Checkout and Automatic Monitoring (CAM) Equipment has greatly enhanced the reliability of complex ground environment systems. Adaptable for use in systems already completed, and as an integration tool for systems currently being implemented, CAM equipment is available for all complex commercial, military, and government systems. For a description of the RCA Checkout and Automatic Monitoring Equipment, write to: RCA Major Defense Systems, **Defense Electronic Products,** CAM 127-204, Moorestown, New Jersey.

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The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA

Where was the Bell Telephone System

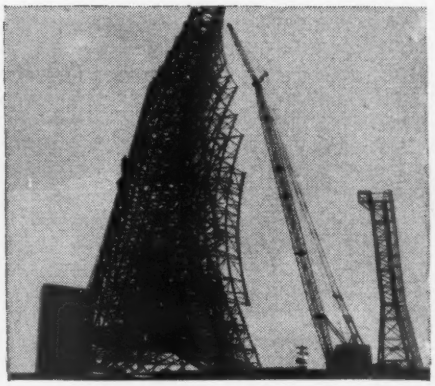
ON FRIDAY, AUGUST 12, 1960?

It was handling some 210,000,000 local and long distance conversations, plus about 5000 overseas calls.

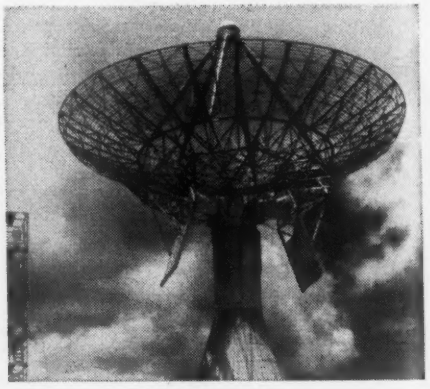
It was guiding Echo I into near-perfect orbit so Bell System scientists could make the world's first telephone call via satellite.

It was developing a world-wide communications system using satellites powered by the Solar Battery, a Bell System invention.

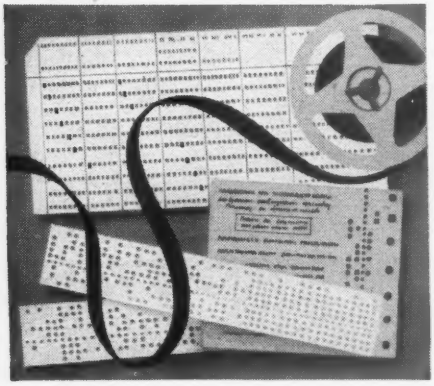
It was offering Bellboy personal signaling to more and more people. Device uses tiny Transistors, another Bell System invention.



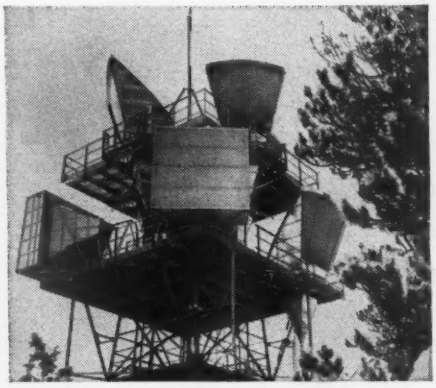
It was building fast, reliable communications for BMEWS—the nation's Ballistic Missile Early Warning System.



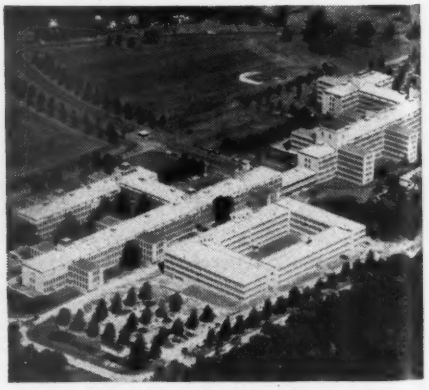
It was constructing a 'round-the-world communications system for America's first man (or woman) into orbit.



It was providing circuits for the speedy transmission of mountains of data for business and government.



It was providing thousands of miles of high-quality circuits for the country's local and network television programs.



And it was delving into innumerable fields of scientific inquiry at the largest industrial laboratories in the world.

It was at the scene of every major communications activity that day, as it is every day.

And for them all—communications on the ground, under the oceans, through the air, around the world—Bell Telephone people "wrote the book that everybody else uses."

How come? Because it's our job to be expert in universal communications.

You have a right to the best service in the world. *And you get it!*

BELL TELEPHONE SYSTEM *Pioneering in outer space to improve communications on earth*

AIR FORCE

and SPACE DIGEST

The Magazine of Aerospace Power / *Published by the Air Force Association*

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Volume 44, Number 2 • February 1961

FEATURES

A Review . . . Now Needed: A Plan
WILLIAM LEAVITT 6

Eugene M. Zuckert—New Air Force Secretary
CLAUDE WITZE 17

Why Not UNITED *Armed Forces?*
JOHN F. LOOSBROCK 38

"For National Security and World Peace"
A SPECIAL REPORT ON AFA'S FIFTEENTH ANNIVERSARY 42

Propulsion: Many Roads Go Up (Part I—The Air-Breathers)
J. S. BUTZ, JR. 48

The American Military Mind in a Strange New World
BRIG. GEN. SIDNEY F. GIFFIN, USAF (RET.) 53

Emergencies Made to Order
TSGT. JAMES R. DOHERTY 93

SPACE DIGEST

Astronautical Attitudes
BY THE BROOKINGS INSTITUTION 59

Telescopes or Spacecraft? We Can Afford Both
ROBERT W. BUCHHEIM 62

In the Space Age, the Crisis Is Man
ARCHIBALD MACLEISH 65

Letter from Boulder
JAMES G. ALLEN 71

USAF School for Space Pilots
WILLIAM LEAVITT 80

Speaking of Space 86

DEPARTMENTS

Airmail 9
What's New With Red Airpower 15
Airpower in the News 16
Aerospace World 26
The Ready Room 98
Tech Talk 102
AFA News 106
Airman's Bookshelf 113
Index to Advertisers 122
This Is AFA 124

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An Editorial

A REVIEW . . . NOW NEEDED: A PLAN

William Leavitt
ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

The report of President Kennedy's ad hoc *committee on space was received at press time at* AIR FORCE/SPACE DIGEST. *Most of our readers will by now have seen the report as it appeared in the daily press. We offer the following editorial comment on its highlights.*

WE HAVE concluded that it is important to reassess thoroughly national objectives in the space effort. . . ."

With these words, in mid-January, President Kennedy's *ad hoc* committee on space, chaired by Professor Jerome B. Wiesner of the Massachusetts Institute of Technology and now the President's Special Assistant for Science and Technology, summarized the introduction to its report.

The report, described by the committee as an admittedly "hasty" review designed to point up problem areas for the new Administration, is not a comprehensive planning paper. But as the possible prelude to the penetrating analysis of the space effort the country has needed so long, it does reflect a healthy realism and the will to plan for an exciting if uncertain future in the space age. The plan itself is yet to come.

At the outset, the Wiesner report makes five points—which needed reemphasis, because, until now not enough people in high policy posts have been willing to accept them as obvious facts of life. They are:

- Space achievements *are* a matter of national prestige. "During the next few years the prestige of the US will in part be determined by the leadership we demonstrate in space activities," and "It is within this context that we must consider man in space."
- Some space developments "in addition to missiles" can contribute much to the national security "both in terms of military systems and of arms-limitation inspection and control systems."
- Space vehicle developments offer new opportunities for scientific advances, and the US has been the outstanding contributor to this pure science pool of new knowledge, and we must improve our position in this area.
- Nonmilitary aspects of space technology, such as satellite communications, weather and mapping vehicles, can make important contributions to our economy—and to our security, as well.
- Many such nonmilitary systems offer "exciting possibilities for international cooperation."

Having spelled out these points, the report comments that "there is an urgent need to establish more effective management and coordination of the . . . space effort. . . . This cannot be done without major improvements in the planning and direction of the program. Neither the National Aeronautics and Space Administration as presently operated nor the fractionated military space program nor the long-dormant Space Council, have been adequate to meet the challenge that the Soviet thrust into space has posed to our military security and to our position of leadership in the world."

Such points have needed bold statement, especially the fact that the Soviet space capability is a real threat to our national security.

The report calls for—and we hope to see soon—the responsibility for all military space developments to be assigned to one agency or military service within the Department of Defense. Such action would be the beginning of an honest recognition of the military mission in space.

The report asserts that the Space Council can do the job of coordinating government space activities and advising the President "only if it is technically well informed, and, moreover, seriously accepts the responsibility for directing the conduct of a coherent national space effort."

This admonition, we hope fervently, will presage the intensive review by the Space Council of national space objectives. And implementing action, after the review.

The report criticizes the drying up of aeronautical research in NASA and warns against the possible loss of traditional leadership in aircraft development. If NASA cannot resume some of its former role in this area, then it may be necessary to give the work to another agency, the report warns.

Acknowledging that our small present booster capability, as opposed to Russian booster prowess, is the key to our lag in manned spaceflight and other astronautical missions, the report calls for thoughtful analysis leading to a true national booster program that will provide both military and scientific needs.

Development of the Saturn, for example, "should continue to be prosecuted vigorously," the report says, but it would be "dangerous to rely on Saturn alone" because of its intrinsic complexity and because "it represents a maximum elaboration of present technology and provides no route to further development."

This is a sensible observation, but again, there is a cursory nature to the comment. Specific objectives and recommendations on booster needs must be forthcoming.

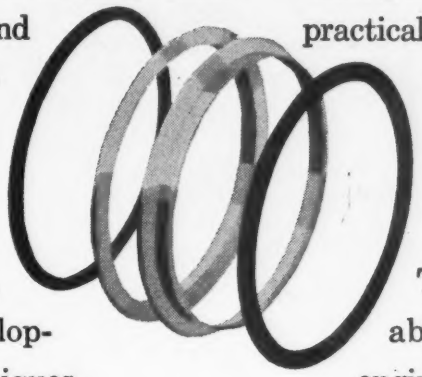
The report criticizes the Mercury program on grounds of technological insufficiency—it suggests that the Atlas may not be able to do the orbiting job. And it warns that perhaps we have overemphasized man in space for its own sake, at the expense of other potentially fruitful space projects. Yet, it must be observed that this criticism is somewhat inconsistent with the report's earlier stress on national prestige as a factor in the space effort. Thus far, with all its problems, man in space has been about the only nationally accepted astronautical goal.

What is needed, of course, is a spelling out of *specific goals* for man in space, including especially manned military operations in space. We would hope that these matters are discussed more thoroughly in the classified military portion of the Wiesner report, which was not made public.

Refreshingly, the report calls for a well planned industry-government program for imaginative use of satellite systems in such fields as communications and weather. In view of their potential contribution to the national security in such areas as implementation of arms control agreement, the report suggests that the military might well be given an active role in such developments.

The committee has taken a quick look at a complex situation and is to be congratulated on its forthrightness. We hope its review will lead to action.—END

Problem: Sealing of heavy-vehicle track components. *Needed:* A seal to keep lubricant in, dirt, sand, grit and water out. *Produced:* A metal-to-metal, floating ring seal by Caterpillar. The result of basic research in metals, rubber compounds, and lubricants—plus development of new tooling techniques.



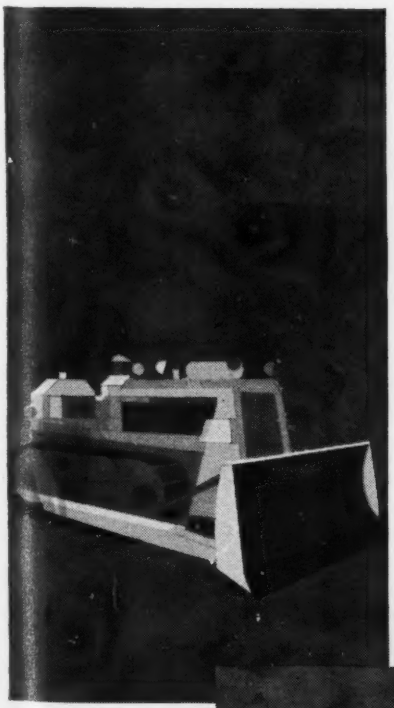
This advance in sealing design permits use of more effective lubricants and eliminates expensive day-to-day maintenance.

Such developments as this typify Caterpillar capabilities in producing sound, practical solutions for mobility needs.

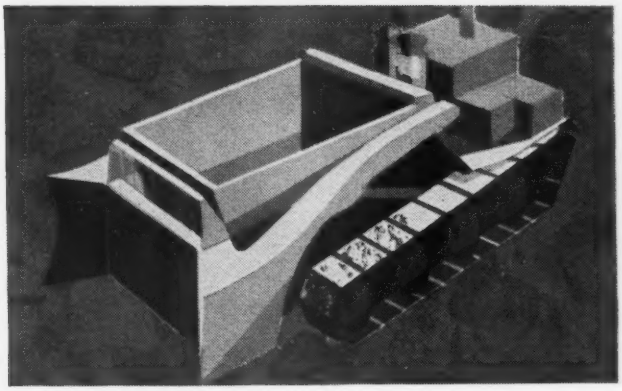
As a leading producer of heavy equipment, Caterpillar has outstanding resources in research, engineering and manufacturing. This experience and talent are available to you to meet your vehicle, engine, or component requirements.

For details of capability, write for Bulletin No. 40-20265. Defense Products Department, Caterpillar Tractor Co., Peoria, Ill.

CAPABILITY IN POWER AND MOBILITY *for defense*



Air-droppable Tractor Bulldozer



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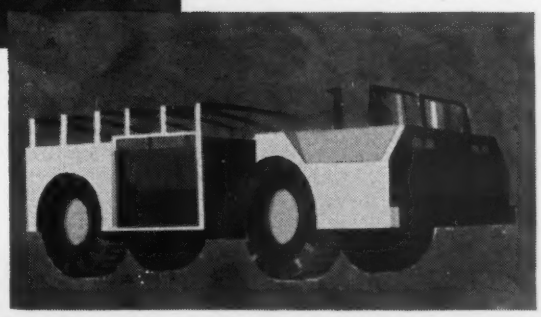

8-ton GOER (under development)

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Washington, D. C. Peoria, Illinois

RESEARCH • DEVELOPMENT • MANUFACTURING FOR DEFENSE

Tracking Every "Bird" in a Flock

Keeping track of a sky full of "birds,"—whether friendly or enemy—poses one of the most complex problems in modern radar electronics.

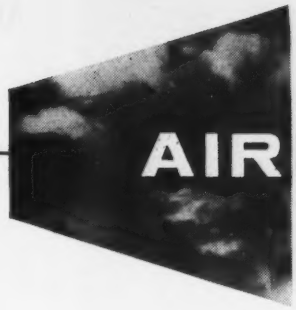
Control centers must know where each aircraft is at all times, whatever the weather. This means its direction, its distance, and its altitude in relation to all other "birds" in the sky. And they must know instantly, for seconds are miles at modern speeds.

In cooperation with the Air Force, Westinghouse Electronics Division at Baltimore has developed a new 3-Dimension radar that can accomplish this difficult task—the versatile AN/FPS-27.

One radar supplies both search and height data simultaneously. In an automatic system, it can supply real time digital data on an unlimited number of targets.

The AN/FPS-27 and other 3-D radars such as AN/TPS-27 and AN/SPG-59, plus high-discrimination radar techniques such as Phalanx and Synthetic Spectrum, are examples of how the Baltimore divisions of Westinghouse are applying electronic science for Defense. *You can be sure . . . if it's*

Westinghouse



AIRMAIL

Statesmanship

Gentlemen: In your December 1960 issue, on page 19, Mr. Witze, in "Airpower in the News," interprets the New York *Herald Tribune* commentary on Mr. Kennedy and his recent campaign.

Mr. Witze seems to feel that the "Trib"—"at least by implication, seems to sneer at the Kennedy effort leading to the White House as that of a competent politician." He goes on to say that perhaps ". . . a competent politician is just what America needs."

It is my contention that a glance at recent history, starting with the early thirties, should be enough to convince any thinking American that America has had its "bellyful" of "competent politicians." The dearth of "statesmen" during this period has been the biggest single factor in bringing about the international, economic, and social problems we face today.

Clifford J. Eardensohn
Bergenfield, N. J.

● *Our office dictionary says a statesman is "a man of outstanding ability in directing the affairs of a government." Senior Editor Witze, who is reasonably familiar with history, observes that the first step toward statesmanship is to get elected and that statesmen are more readily made out of politicians than out of other timber. The name Winston Churchill leaps immediately to mind. Abraham Lincoln is another.*— THE EDITORS

To Save Lives

Gentlemen: During World War II, we used IFF [identification, friend or foe] for identification. As I recall, friendly aircraft using IFF could be identified on the radarscope. Unfriendly aircraft likewise could be identified by the red blip. It is my suggestion that all civilian passenger planes be equipped with similar identification methods and that when they are instructed to leave their holding pattern to make their approach for landing, or in any emergency, they will be required to turn on their identification mechanism. This would make surveillance, with, perhaps, special attention, much easier for the control operator.

On several ocasions, I have had the opportunity to visit the radar control room of several of our smaller western fields, and I have noticed that when two aircraft are approaching each other on a collision course, the controller assumed they had altitude clearance and neither aircraft was warned of the possible danger. I feel this assumption should be reversed and that two approaching aircraft should be considered as at the same altitude and should be warned.

This is respectfully submitted in the hope that it may save a life.

Maj. Goldie Marcott, AFRes
Sublimity, Ore.

Easy on the Eyes

Gentlemen: Reference the Southwest Airmotive ad, page 143 of the December 1960 AIR FORCE/SPACE DIGEST—Jet Age Jane. Bring on the girls! No magazine is interesting without pretty girls.

Capt. Gayle B. Gardner
APO, San Francisco, Calif.

Strategy Dilemma

Gentlemen: Dr. Schelling's excellent article, "Meteors, Mischief, and War," in the December 1960 issue of AIR FORCE/SPACE DIGEST, is a thought-provoking exercise in the dilemmas of cold-war strategy. His speculation is well taken as to circumstances which might render unstable the balance of deterrence and thus force consideration to "crash disarmament" as an alternative to a nearly inevitable war. This very disturbing situation may well come as Red China and others join the Nuclear Club.

It would then be impossible on a "crash" basis to give adequate and painstaking consideration to each of the many delicate military situations which could evolve during steps of the various disarmament proposals. As long as it is our stated policy to seek controlled disarmament, let us insist on full participation and contribution by those responsible for our nation's security. While the JCS has a small staff exclusively on disarmament, it seems logical that this military effort should be beefed up as an insurance program against some future day when emphasis could shift to overriding political considerations.

The writer has just returned from a two-month business trip to Europe while at the same time gathering material for a War College thesis on the subject of disarmament. Incidently, articles in AIR FORCE/SPACE DIGEST have been an invaluable reference source for Extension Course Institute War College papers.

Lt. Col. H. N. Bailey, AFRes.
Los Angeles, Calif.

Some Hands Were Raised

Gentlemen: I would like to raise my hand in response to the suggestion that AFA produce a series of folios of our famous military aircraft.

I certainly enjoy the interesting and informative articles in the magazine. As a rated Air Force officer I consider it a must in my monthly reading.

I look forward to your up-to-date reports on Air Force development and progress. My own interest concerns electronic warfare, and I would like to see a good article on this growing and important field.

Keep up the fine, objective reporting.

1st Lt. Daniel J. Fabricy, III
Keesler AFB, Miss.

Gentlemen: Re Guy Nicholson's letter in the December issue, I agree with his idea [for prints of famous aircraft, suitable for framing]. Being an avid aviation historian as well as model builder, AFA member, and airline employee, I would be very interested in a series of paintings or reproductions of historical military aircraft. In fact, I have acquired a fair-sized collection by contacting the various aircraft companies. All of the companies contacted have responded very well. . . .

By the way, your magazine gets better all the time. The only addition that I would welcome would be a series on our aces and famous airmen.

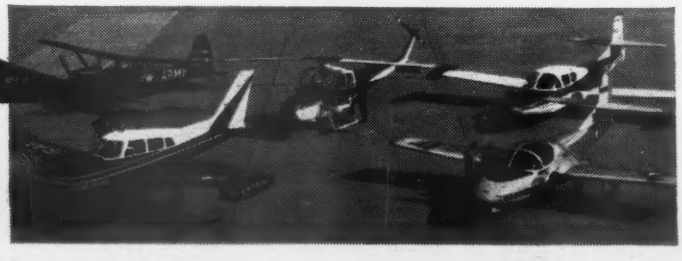
Kent Kistler
Minneapolis, Minn.

Gentlemen: I agree with Mr. Nicholson . . . that a series of folios of military aircraft should be published. I

(Continued on following page)

Have a seat in the highest-performance primary trainer in Air Force history: Cessna T-37

Settle back where nearly 3000 student pilots already have come to grips with the thought of *learning* to fly in a high-performance *jet*. For many, the twin-jet T-37 was the first plane they'd ever flown; for some, the first they'd ever been *in*. Fast company for our airmen of tomorrow? Decidedly—for that's what tomorrow's aviation demands. But good company, too: seating the instructor at student's side, the T-37 teaches modern-day primary better, faster, more safely than ever before.



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believe that there are many people across the country who would "give anything" to see these folios put out.

I myself prefer the late World War II and aircraft of today, although there are other people who would like the World War I planes also.

Another subject for you to consider is Roy W. Carlson's suggestion (also in "Airmail," December issue): "Not enough information regarding AAF history, groups, squadrons, air forces, wings, divisions, etc." I agree with him and wish you would take into consideration this suggestion: that you would write a page on the history of each division, one at a time. This could become a monthly feature. I think everyone who reads AIR FORCE/SPACE DIGEST would appreciate such a series.

F. Gay Webb
Lexington, Ky.

Gentlemen: Reference your December 1960 issue and the letter from Guy H. Nicholson. You can count on my support of any project of the type suggested by Mr. Nicholson.

Maj. John A. Paller
Charleston AFB, S. C.

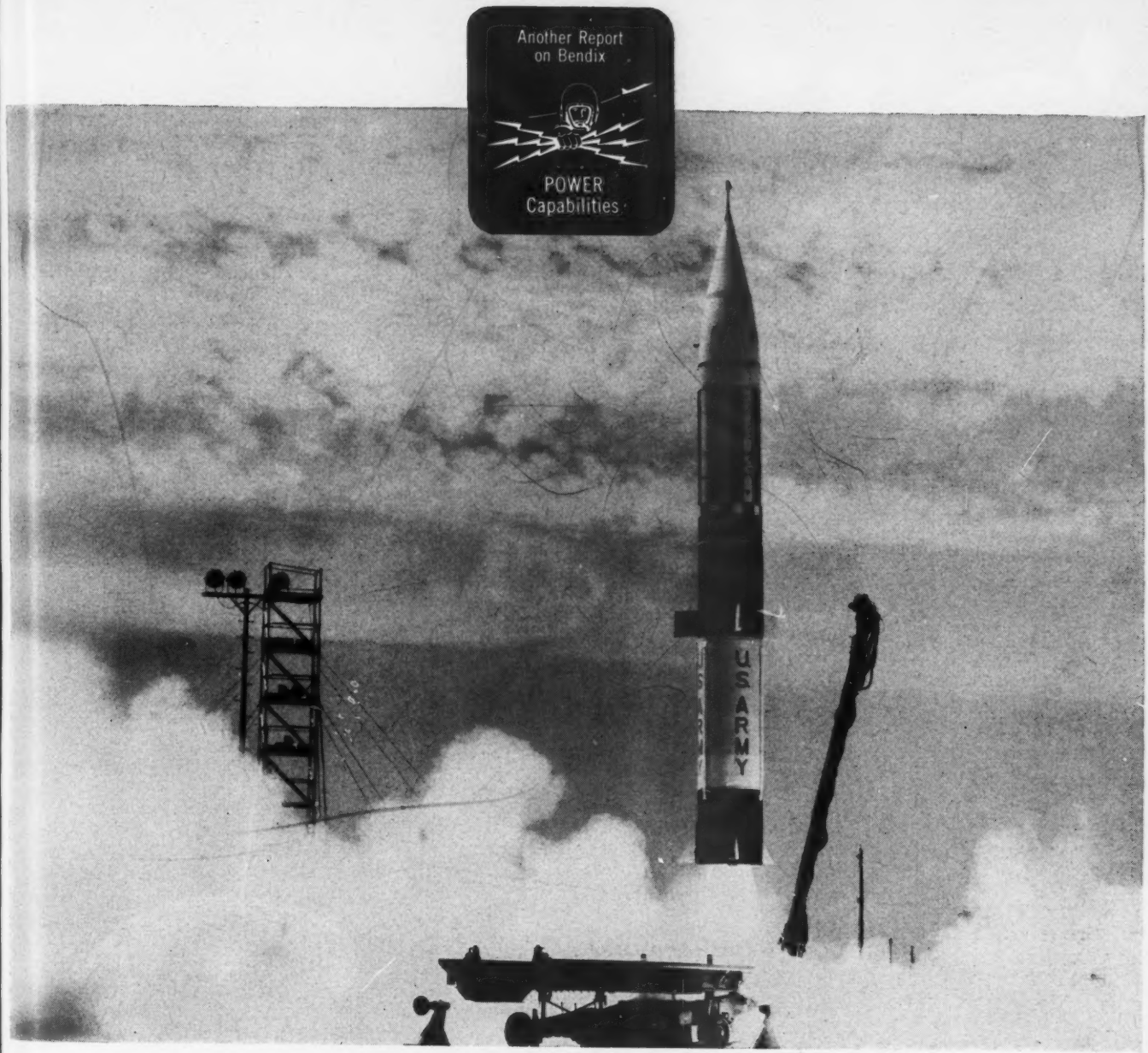
Full Complement Scheduled

Gentlemen: Reference your item about the Minuteman on page 29 of the December 1960 issue. Since I am assigned to the Site Activation Task Force here at Malmstrom AFB, I read the item with a great deal of interest. All that I can say is, "Somebody goofed!" For your information, the SATAF is installing 150 missiles in underground silos and fifteen Launch Control Centers, for a total of 165 installations. There will be three flights, numbers I, II, and III, each with fifty missiles and five LCCs.

No doubt this will not be the only letter you receive about this error, but no person, from Airman Basic on up, likes their outfit to take a cut of two-thirds. Keep up the good work, however. In a magazine as good as this mistakes will come to the surface once in a while.

A1C Paul E. Garner
Malmstrom AFB, Mont.

● *Our item said that "operational date for the first Minuteman squadron had been advanced a full year to July 1962 with fifty-five missiles in underground silos. . . ." Perhaps it would have been more appropriate to note that fifty missiles and five Launch Control Centers would be operational by July 1962, with others scheduled for a future date, bringing the total up to 165 installations.*—THE EDITORS



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For additional information concerning the PAT-C system or other controls capabilities contact Dick Oblinger, Chief Application Engineer, Controls and Accessories Division.

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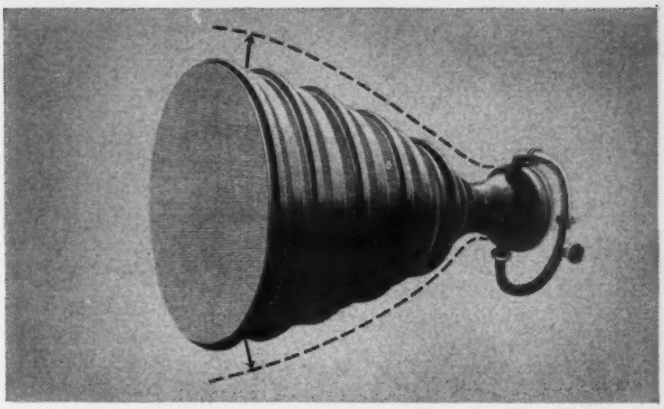

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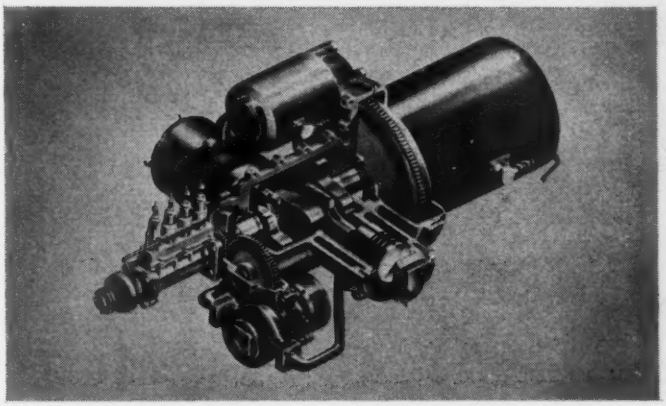

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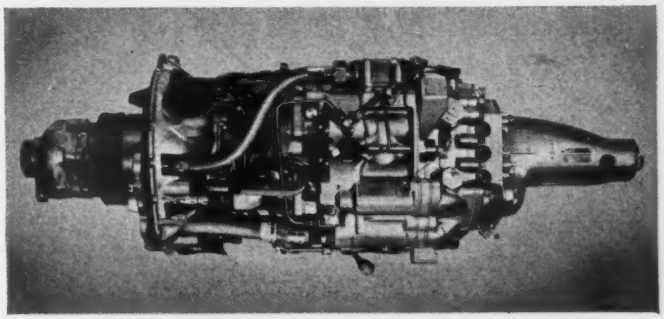

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What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

A new turbofan transport, the **Tupolev TU-104E,** is expected to begin service with the Russian civil airline **Aeroflot** before June. This 120-passenger aircraft is now almost at the end of its flight-test program. Aeroflot officials report that it has developed **no serious technical problems.** The two turbofan power plants in the aircraft are rated at **more than 25,000 pounds thrust** and apparently are a development of the series of large turbojets in the 15,000- to 20,000-pound-thrust range designed by **Mikulin** during the early and middle 1950s. This series of Mikulin engines has been used in the **previous TU-104** transports and various military aircraft.

The basic TU-104 began service in 1956 in a **fifty-passenger version.** The model grew into the **seventy-seat TU-104A** and the **100-passenger TU-104B.** The growth has been achieved by **lengthening the fuselage several feet** and using higher seating density. The first TU-104s had **much greater leg room** than first-class seating configurations on western airlines.

Speed of the TU-104E probably will not be higher than that of the TU-104B, which has **averaged 631** mph around a 620-mile course with a payload of better than 33,000 pounds, according to the Soviets. **Normal cruise speed** is at least **sixty mph lower,** however. The **improved specific fuel consumption** of the turbofan engines should give the TU-104E a much better seat-mile operating cost.

The four-engine version of the TU-104, the **TU-110,** has been **dropped by the Russians** because it had **too much power to be used efficiently** in the subsonic TU-104 airframe. It carried **about 100 passengers,** and its performance was **no better than that of the twin-engined TU-104B.**

Aeroflot is also scheduled to receive its **second type of turbofan transport** shortly before the end of 1961. This is the **TU-124,** which is **almost a carbon copy** of the TU-104 except that it is **slightly scaled down** and carries **forty to sixty passengers.** Two **Soloviev turbofan** engines are used in this aircraft.

The TU-124 and TU-104E point up the basic Soviet policy of **economy of design** effort in the civil transport field. Their entire fleet of turbojet and turbofan transports has been **derived from the TU-16 Badger bomber** airframe laid down by **Tupolev** more than seven years ago. At least **six different turbine transports** have been built using this same configuration **without making one major aerodynamic improvement.**

Evolutionary modernization, such as the use of **thinner wings,** would have allowed the Russian transports to **compete economically with western aircraft** that came along a little later. Apparently the cost of doing this could **not be justified** in the eyes of the Soviet policy makers.

Only major Aeroflot transports not derived from military aircraft are the **Ilyushin IL-18,** four-engined turboprop in the class with the Lockheed Electra, and the **Antonov AN-24,** forty-passenger aircraft which greatly resembles the Fairchild F-27. The **IL-18** has established a **good record** in domestic and international service and apparently is the **most attractive Soviet aircraft to airline operators,** which must operate under a **western-style cost-accounting system.** The Russians report that the **AN-24** is progressing well through its **development flight-test program** and is now due to enter scheduled service with Aeroflot **before the end of this year.**

One of the most urgent Aeroflot requirements is for a **very large, very long-range transport** with fairly high speed to improve **travel between western Russia and the Soviet Pacific.** The only aircraft designed to meet this requirement **is an adaptation of the Bear intercontinental bomber,** the **TU-114,** which can carry up to **220 passengers.** The Russians indicate that the TU-114 has just **entered scheduled service** over an approximately **3,000-mile route,** but their plans called for it to be flying **nonstop between Moscow and Vladivostok** almost two years ago. The delay has been caused by the **reduction gearing in the engines.** The **Kuznetsov turboprop power plants** in the TU-114 develop a little more than **10,000 equivalent shaft horsepower** (ESHP) and are slightly derated versions of the engines in the Bear bomber. They swing **counterrotating propellers** with a total of eight blades. The long delay in the TU-114 development and the fact that the **military must be hampered by similar trouble,** even though their requirements are not as rigid as Aeroflot's, has caused many western observers to conclude that the most experienced and competent Soviet development engineers have moved on to **more advanced projects.**

If the TU-114 is now able to hold up **under airline-type usage,** then the Russians have an aircraft which can **materially improve their airline's performance** and bring a large **increase in their passenger-mile picture.** It is estimated that a fleet of fewer than **twenty-five TU-114s** operating to Vladivostok and Siberia from western Russia could carry **more passengers** than all available surface transportation **combined, including the transsiberian railway.**

Even though Aeroflot has been given the tremendous task of **increasing passenger traffic six times** during the current (1959-1965) seven-year plan, the general policy of **economy of capital investment and design effort** has been applied to the improvement of many of its resources.

A big **program is under way** to improve the currently **poor airfield and passenger terminal situation** over most of the Soviet Union, but **maintenance facility modernization is being postponed** until a later date. While current Aeroflot maintenance practices have not been described as unsafe by anyone who has observed them closely, the work continues to be done **primarily out of doors,** even in bitter winter weather. There are very **few heated, completely enclosed hangars** available to Aeroflot even for major overhaul. Most maintenance is accomplished completely in the open in good weather and with canvas coverings placed around portions of the aircraft in winter.

Such procedures naturally **lengthen the time required to accomplish any given maintenance task. As a consequence,** Aeroflot aircraft have **high down times,** and its **fleet of transports is larger than would be required** by a western airline to handle similar route and **service situations.** The large numbers of aircraft on the ground at major civil airfields such as Vnukovo in Moscow attest to this policy. An added benefit of a large Aeroflot aircraft inventory is its **function as a reserve** for the military.—END

AIRPOWER in the news

Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

Cost Is Related to Strategy

WASHINGTON, D. C.

It is early January; carpenters are building elaborate stands along Pennsylvania Avenue for the Kennedy inauguration, and Congress is in session, restless and itching for debate. The first bouts, it appears, will be about such things as the power of the House Rules Committee and the Senate's attitude on filibustering. Frank Sinatra is in town, laying plans for a big inaugural show in the D.C. National Guard Armory in honor of the new President. So far, Mr. Kennedy has not paid any public attention either to the congressmen or to Mr. Sinatra. He has concentrated on picking out his official family and has done so with remarkably few repercussions. There have been growls about Bobby Kennedy getting the job as Attorney General. Some Michigan Republicans are quoted as delighted with the idea of sending G. Mennen Williams to Africa. Some Democrats are upset at the prospect of having a Negro, Dr. Robert C. Weaver, in charge of the Housing and Home Finance Agency. But it is hard, at this early stage, to find fault with most of Mr. Kennedy's selections.

A couple of months ago we quoted here at length from the opinions of Paul H. Nitze, who has been named an Assistant Secretary of Defense for International Affairs. It was pointed out that Mr. Nitze thinks well of a strong President and believes in making sure that major policies are consistent. Over in the State Department his opposite number will be John J. McCloy, who has the title of Disarmament Administrator. The two men are expected to play an important role in President Kennedy's efforts to test Soviet attitudes toward arms control. The planning effort in this area will be greatly expanded.

At the Pentagon's management level, perhaps the most important man helping to shape this policy will be Charles J. Hitch, the new Defense Department Comptroller. Mr. Hitch comes from the RAND Corporation in California, which is an Air Force contractor, providing deep studies on a wide variety of subjects, including economics. Defense contractors of all kinds could profit from reading a book coauthored by Mr. Hitch last year, entitled *The Economics of Defense in the Nuclear Age*, published by the Harvard University Press. It makes it clear that he does not approach his new job as a keeper of the coffers. Strategy and cost he compares to the front and rear sights of a rifle; you can't ask for the correct position of one without relating it to the other sight and to the target. And, his book says, "The job of economizing, which some would delegate to budgeteers and comptrollers, cannot be distinguished from the whole task of making military decisions." He says that the way to save is in the choice of strategies to achieve objectives. It seems fairly clear that the new Administration—Messrs. Nitze and McCloy at the working level under the cabinet—contemplates strategic changes and that some of them may result from the arms control program.

These changes in strategy, if they come, will be far too late for Mr. Hitch to utilize in his first appearances on Capitol Hill. The Eisenhower budget was sent to Congress a few days before the inauguration. Nobody in the old Administration will be asked to stand up and defend it, and the new Administration will need time to decide what the initial strategy should be and what is needed to carry out that strategy. Then Mr. Hitch will face some changes in the procedures used on Capitol Hill. Before the House Appropriations Committee can be asked to draw up a bill for the Pentagon there must be hearings by the House and Senate Armed Services Committees, and the chambers must vote "authorization" for specific weapon system projects. This is a new proviso, effective January 1, 1961. It means that Rep. Carl Vinson, venerable chairman of the House Armed Services Committee, will have a strong voice in the determination of what missiles, airplanes, and ships are chosen to carry out whatever strategic policy is favored. It is a position that has been assumed in recent years by the House Military Appropriations Subcommittee, headed by Rep. George Mahon. He has not been jealous of the responsibility, even lamenting that these chores are handed to Congress from time to time. Now, however, with signs that the Pentagon will exercise leadership and make its own hard decisions, Mr. Vinson is geared and empowered to exercise influence.

According to Mr. Hitch's book, there is room for a lot of improvement in the way military budgets are tabulated and presented. The way appropriation groups are listed has little, if anything, to do with missions. Hence, he concludes, the choice of program sizes can be made easier by putting budget figures into new categories. Such a budget, designed to show how much it will cost to carry out a mission, will have to cross departmental lines. One illustration would divide the funds into three broad programs covering deterrence and all-out war, deterrence and limited war, and research and development. Each of the broad programs in the budget format suggested by Mr. Hitch can be divided into component missions. This is where specific weapon systems are mentioned and where they will be weighed.

The Hitch approach, whether it comes this spring or is developed for the fiscal 1963 budget, will not get unanimous acceptance on Capitol Hill. There are congressmen, as well as men in uniform, who want all things divided among the Army, Navy, and Air Force.

We Can't Ignore Mach 3

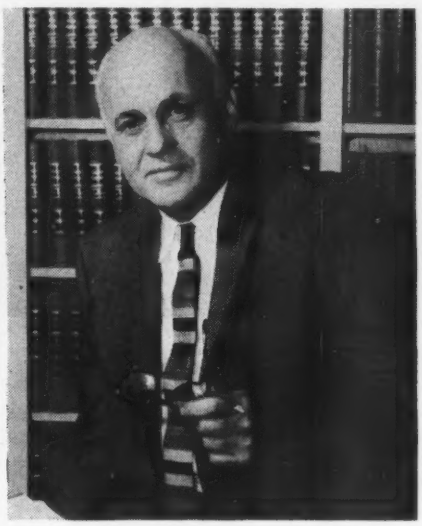
On the eve of his departure from his post as Administrator of the Federal Aviation Agency Elwood R. "Pete" Quesada recommended that the United States give "prompt and careful" consideration to a program for development of a supersonic commercial transport. By supersonic he meant a Mach 3 airplane and a new design, not a slower adaptation of vehicles utilizing present state of the art.

(Continued on page 19)

Eugene M. Zuckert Is Named USAF's New Secretary

There are some general officers in the US Air Force who predicted two years ago that Eugene M. Zuckert would be named USAF Secretary if the Democrats elected a President in 1960. They were right.

Some of these same officers are among the many Pentagon toilers who have loudly lamented the paucity of executive decisiveness in the past few years. There is every indication that their man, now in office, is part of a team that has heard their cries of distress and will do something about them.



Eugene M. Zuckert

There is little in the published record about the opinions of Gene Zuckert, but it is known that he is close to Sen. Stuart Symington and the new Deputy Secretary of Defense, Roswell L. Gilpatric. The Missouri senator was chairman of a committee that recently urged upon President Kennedy a program for full unification of the Defense Department. Mr. Gilpatric was a member of the committee. On top of this, Mr. Zuckert is a longstanding personal friend of Robert S. McNamara, the new Defense Secretary with whom he was associated on the faculty of the Harvard Graduate School of Business Administration. Regardless of the fate of the specific Symington suggestions for reorganization, the need for action in this area is obviously endorsed by the front office, both in USAF and Defense.

It cannot be assumed that when these men make decisions there will be no more cries of distress. There will be. There is sound speculation that there will be executive action in the area of mission definition for the armed forces. This can lead to further action on weapon systems. There are several systems in the research and development stage where the Army, Navy, and Air Force each has its own individual projects.

These are problems in management and particularly in fiscal management. USAF Secretary Zuckert is an acknowledged expert in the field. A lawyer with early experience as an attorney for the Securities and Exchange Commission, he was at the Harvard Business School from 1940 to 1944, both as a teacher and assistant dean.

While on that faculty he was a special consultant to the Air Force on statistical controls, and in this capacity he helped train more than 3,000 officers in the specialty.

Mr. Zuckert served for a time in the Navy in the office of the Chief of Naval Operations, where he was a lieutenant (junior grade) working on an inventory control program. He was released late in 1945 to become Executive Assistant to Mr. Symington, who then was chief of the Surplus Property Administration. Then, in early 1946, Mr. Symington became Assistant Secretary of War for Air and moved along to be first Secretary of the Air Force when the National Security Act became effective in late 1947. Mr. Zuckert accompanied him in both offices and served as Assistant Secretary of USAF from the beginning until he was appointed to the Atomic Energy Commission in 1952. Mr. Zuckert is credited with parenthood of the USAF fiscal management program.

Mr. Zuckert, who is forty-nine years old, stocky, energetic, blunt, bald with a generous fringe of whitish hair, has been described as a practical egghead. He is a native of New York City, took degrees from Yale in 1933 and 1937, when he became a lawyer and completed a combined law-business course at Harvard and Yale. He is a member of the bar in Connecticut, New York, and the District of Columbia. Part of his legal impact on the Pentagon was made in 1948, when he served on a committee set up by the first Secretary of Defense, James Forrestal, to establish a unified code of justice for the military services.

Since retiring from the Atomic Energy Commission in 1954, Mr. Zuckert has practiced from a law office in Washington which he shares with Harold Stuart of Tulsa, Okla. Mr. Stuart also was mentioned as a candidate for the USAF job before Mr. Zuckert won the nod from President Kennedy. Mr. Stuart is a former President of AFA.

As an atomic energy consultant and attorney Mr. Zuckert served as board chairman of the Nuclear Science and Engineering Corp., of Pittsburgh, a firm that has pioneered in the field of radiation chemistry. He also was a director of AMF Atomics Ltd., of Canada, a subsidiary of American Machine and Foundry, Inc. He is coauthor of a book called *Atomic Energy for Your Business,* a member of the executive council of the Yale Law School Association, and a trustee of the Landon School in Bethesda, Md. He lives in Chevy Chase, Md., with his wife and three children.

One of the first actions taken by Mr. Zuckert when his appointment was disclosed was the selection of a special assistant to oversee and coordinate USAF's activity in public information and congressional liaison. Chosen for the position was Edward R. Trapnell, who had experience in this field with the AEC. His selection marks a new recognition on the part of the Secretary's office of the importance of these areas and the requirement that the Air Force position be presented to the public and Capitol Hill in terms that are consistent and convincing.

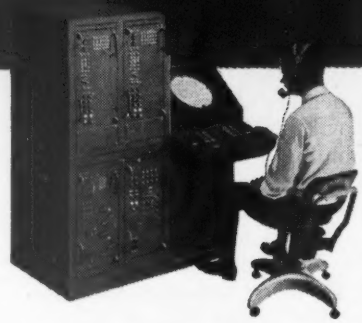
—Claude Witze

"TURN RIGHT HEADING 270°...

ONE MILE FROM TOUCHDOWN...

ON COURSE...

ON GLIDE PATH..."



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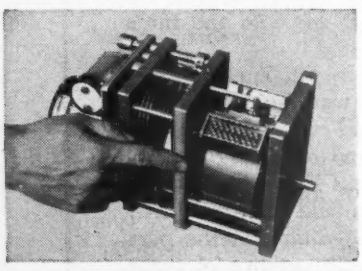

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"The supersonic transport is inevitable," the administrator said. "The dynamic nature of aviation demands constant progress—a Mach 3 transport is the next natural step. Some nation will build this airplane. If we are to move ahead in the 1960s this nation, with its military and civil experience in producing the world's finest aircraft, must give serious consideration to this program now and take the indicated initiative without further delay."

In tossing this out as another challenge facing the Kennedy Administration, Pete Quesada did not go to the extent of reviewing the recent history of the project. The Mach 3 transport proposal calls for a joint effort of FAA, the Air Force, and the National Aeronautics and Space Administration. The program was approved by the Air Staff even before being submitted for signature to the FAA administrator and T. Keith Glennan, chief of NASA. With their names affixed, it was sent to the Secretary of Defense about the first of November. It called for initial approval of a development schedule that would cost $17.5 million in fiscal 1962 and $35 million in fiscal 1963. After a month, it was approved by Defense Secretary Thomas S. Gates Jr., with the proviso that the first year's cost should not exceed $5 million. This was passed to the White House, where one of the last acts of the Eisenhower Administration was to disapprove the proposal.

It is clear that Pete Quesada, on the eve of his own departure for the more orderly business of managing a baseball club, did not choose to quarrel with the lame ducks on the other side of 17th Street. He should get credit, however, for putting his conclusions on the record and releasing the FAA report on the project, which was prepared with the assistance and approval of the Defense Department and NASA.

The report says that a commercial Mach 3 transport is technically feasible but that the size and cost of the operation "preclude its accomplishment on a timely basis solely by private enterprise." It says the program will bring economic benefits and ensure our continued leadership in commercial aviation. It will contribute to our national prestige and security. It should provide, the report says, "financial support, coordinated government leadership, and a maximum of industry participation."

Further, the report says the government should provide assistance only, retaining the advantages of industrial competition wherever possible. It says financial aid should be limited to real necessity and that the airlines should have a voice in the program. It says the government should recover as much as possible of its expenditure.

In the Kennedy Administration and on Capitol Hill the Mach 3 transport proposal is going to contend for attention and money with several other requirements. Even as the FAA report was released it got fewer headlines than the studies urging action on the economy, depressed areas, education, and housing. Like these voids, it cannot be ignored.

Doesn't Anybody Get Mad?

Among the USAF officers who did *not* march in the inaugural parade in Washington on January 20 were Captains Freeman B. Olmstead, John R. McKone, Dean B. Phillips, Oscar L. Goforth, and Majors Eugene E. Posa and Willard G. Palm. One of these officers is dead, three are missing, and two have been held prisoner in Moscow for almost seven months. They were the crew of an RB-47 that was shot down by a Russian fighter plane into the Barents Sea on July 1, 1960. They were about fifty miles off the Soviet seacoast when the attack took place.

USAF Captains John McKone and F. B. Olmstead have been held in a Russian prison since July 1, 1960, when they were shot down with the rest of their crew in an RB-47.

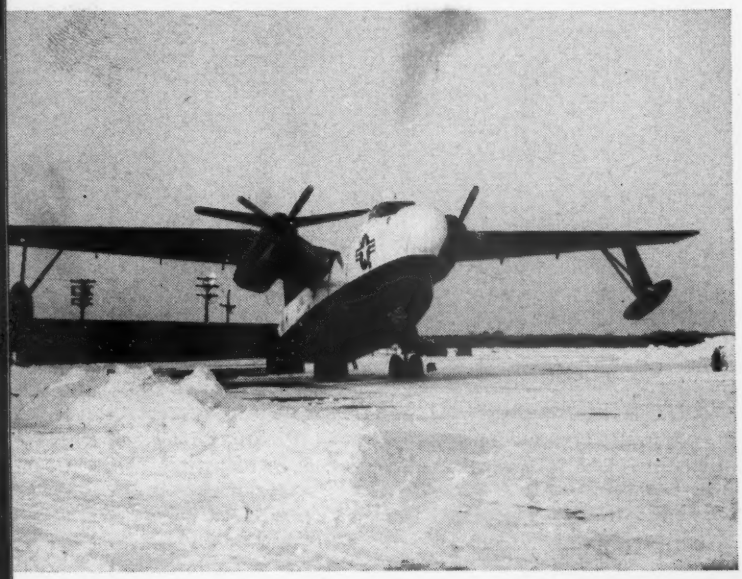
At this writing, in early January, the United States government is waiting for the Russians to do something about it. Nikita Khrushchev is quoted in press dispatches from Moscow as saying he hopes the inauguration of John F. Kennedy as President will bring a "fresh wind" into his relations with Washington. There is speculation that Nikita himself may try to start some kind of a breeze by turning over Captains Olmstead and McKone, the two men who have been suffering Soviet hospitality since they were picked out of the sea.

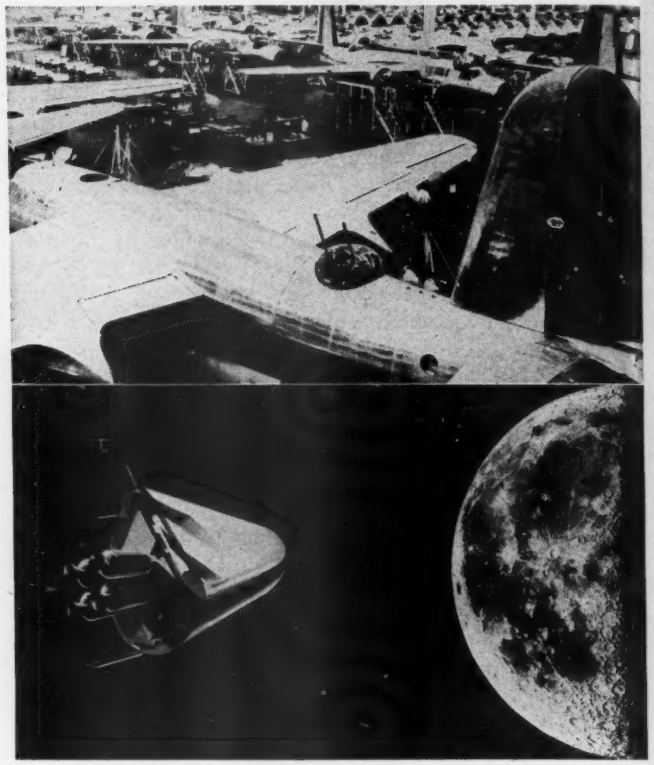
If this comes true, and it could happen before this issue of our magazine is printed, there is grave danger that the gesture will be misinterpreted not only in other countries but in this one as well. There are, as one commentator has pointed out, gullible Americans who will think that tensions are relaxing. That this could be true because the two men are released, if they are, will be as transparently false as the aura of good will that some sensed with the spirit of Camp David. There must be no mistake about it. The RB-47 incident was an act of piracy, and no shift in the Soviet attitude can be accepted as a peace gesture. What is needed here is some insurance that the Reds will not get away with the piracy, the murder of four men, and imprisonment of two others.

Another aspect of the situation is a tendency of Moscow to ignore the RB-47 case in public pronouncements, while it continues to make an issue out of the U-2 incident. Francis Powers, the U-2 pilot, did fly over Russia and was shot down in that country. Which brings up a second possibility against which Americans must stand guard. We must not let Khrushchev confuse these two cases in the eyes of our allies and the neutral nations. There is no parallel between them, and any effort to draw one should be repudiated.

As for the plight of Captains Olmstead and McKone, we have sensed in recent weeks a growing impatience with the State Department, which is credited with doing too little and contenting itself with routine pleas for release of the two officers. Well, the State Department can do as much about it as is requested by the Executive Department and the Congress. In these last seven months, the US Congress at least has remained sensitive to public opinion, although the fact remains there has been no loud public clamor for stern action. Captain Olmstead and Captain McKone took solemn pledges when they entered the armed forces. These pledges defined their duty to their country. This responsibility is a two-way street, and all Americans have a duty to perform, if necessary, for these

(Continued on following page)





Delivering its last "atmospheric airplane"—the Navy P5M-2 above—the Martin Company marked the end of a transition that puts the firm exclusively in the missile and space business. More than 12,000 airplanes have been built by Martin. Biggest single production line was for the wartime Army Air Forces bomber, the B-26, at upper right. For the future, Martin is on the road to the moon (right) with this design, among others, for NASA's Project Apollo.

two men. They cannot salve their consciences by kicking the State Department because they are willing to sacrifice the freedom of two men as the climax to an era of complacency. That complacency was not born in any branch of our government. It is the child of the people.

History in Maryland

With only a slight appetite for nostaglia, we dropped into the Strawberry Point hangar of the Martin Company one cold day just before Christmas to see history made. It was a Navy show. Some admirals made speeches, and a band in dark blue played "Anchors Aweigh." The occasion: delivery of the company's last real honest-to-gosh airplane, a P5M-2 flying boat. The transition, the company announced, was from "aircraft manufacture to missile and space vehicle pioneering."

Little was said about the Air Force. One of the speakers pointed out that the P5M-2 just ready to roll out in the sunshine was the 2,312th Martin-made aircraft delivered to the Navy since 1916. There was no mention of the fact that the Army Air Forces, predecessor of USAF, bought 5,631 bombers from this company. They were B-26s, and in August of 1945 everybody was too busy to call in a band for the last roll-out. But there was one, and it marked the final delivery on contracts with a value of $935.4 million. The B-26s alone accounted for forty-six percent of the total aircraft built by Martin in the fifty years it was getting ready to go into space.

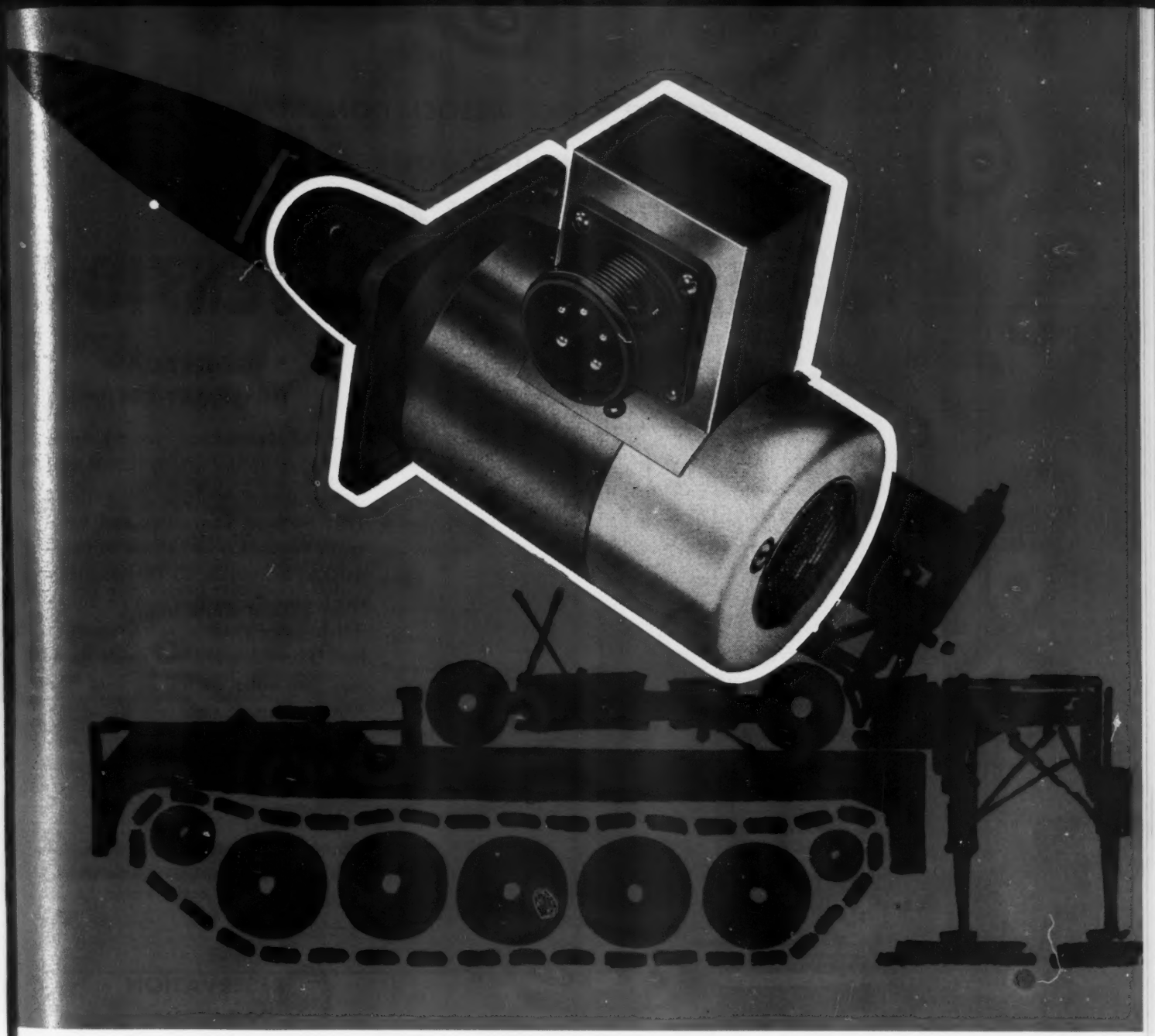
Also unmentioned in the day's ceremonies was the dark chapter of Martin Company history. Barely a decade ago this firm staged one of the great comebacks of aviation industry history. It was the new management installed at that time which took a hard look at the future and started Martin on the path to its present rating as the fifth largest research and development contractor for the Defense Department.

It is a tribute to the company that all branches of the armed forces have put reliance in its capability to develop weapon systems, and that it has pioneered in space with the same fervor that Glenn L. Martin, the founder, put into early flying machines. While Martin today is working on such esoteric projects as Apollo, which may carry men to the moon, and Dyna-Soar, USAF's orbiting glide vehicle, it remains that weapons are responsible for the production lines. There are Titan, Mace, and Matador for the Air Force. There are Bullpup for the Navy and Lacrosse and Pershing for the Army. The history of the last fifty years has not changed because technology has shifted. It is the military mission in space that demands industrial pioneering in 1961 just as the military mission in air demanded it over the past half-century.

Bill Bergen, youthful Martin president, has helped father the missile and rocket age from his office at Middle River, Md. It was his effort that produced Matador when a lot of other engineers, probably just as capable, lacked the kind of imagination that Glenn L. Martin wanted to bequeath. He has seen the transition and believes the future is unlimited. This company, Mr. Bergen said, will not go out of business if peace breaks out. He acknowledged they would lose weapon system development and production contracts in the event of real disarmament. But, he said, there is more to it than that:

"If we have the skills and management capabilities we think we have, our company and other leaders of the defense industry could more than offset such a loss immediately with corresponding gains in the space business and in the business of devising and producing the complicated mechanisms of global surveillance that will be vital to keeping the peace once it has been achieved."

If this is true, and nobody has challenged it, it means that the frontier of space, to which the Martin Company bowed when it delivered the last airplane, holds greater opportunities than the frontier penetrated by the firm fifty years ago. The progress from a "kite with a motor in it" that Glenn L. Martin built in 1909 to the last P5M-2 with serial number 147937 held no such promise. Neither did 5,631 B-26 bombers.—END



HYDRO-AIRE DEVELOPS NEW HIGH-PRESSURE, MINIATURE HYDRAULIC POWER PACKAGE FOR PERSHING, OTHER AIRBORNE APPLICATIONS

This new integrated pump-motor offers the smallest displacement of any high-pressure unit in the industry. It exhibits over-all efficiencies of 57-62%, weighs just 4.0 lbs. and measures only 3 by 4.5 by 6.5 inches. A common shaft and bearing arrangement contributes simplicity, reliability, and weight savings to a design with rated delivery of 0.34 GPM minimum at 3250 psig over 25.5 to 30 VDC. This is but one of a number of hydraulic power packages available at Hydro-Aire and applicable to a wide range of plug-in airborne control systems. If you have such an application, write Hydro-Aire for a prompt quote.

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TO ATTEND THE 15th ANNUAL

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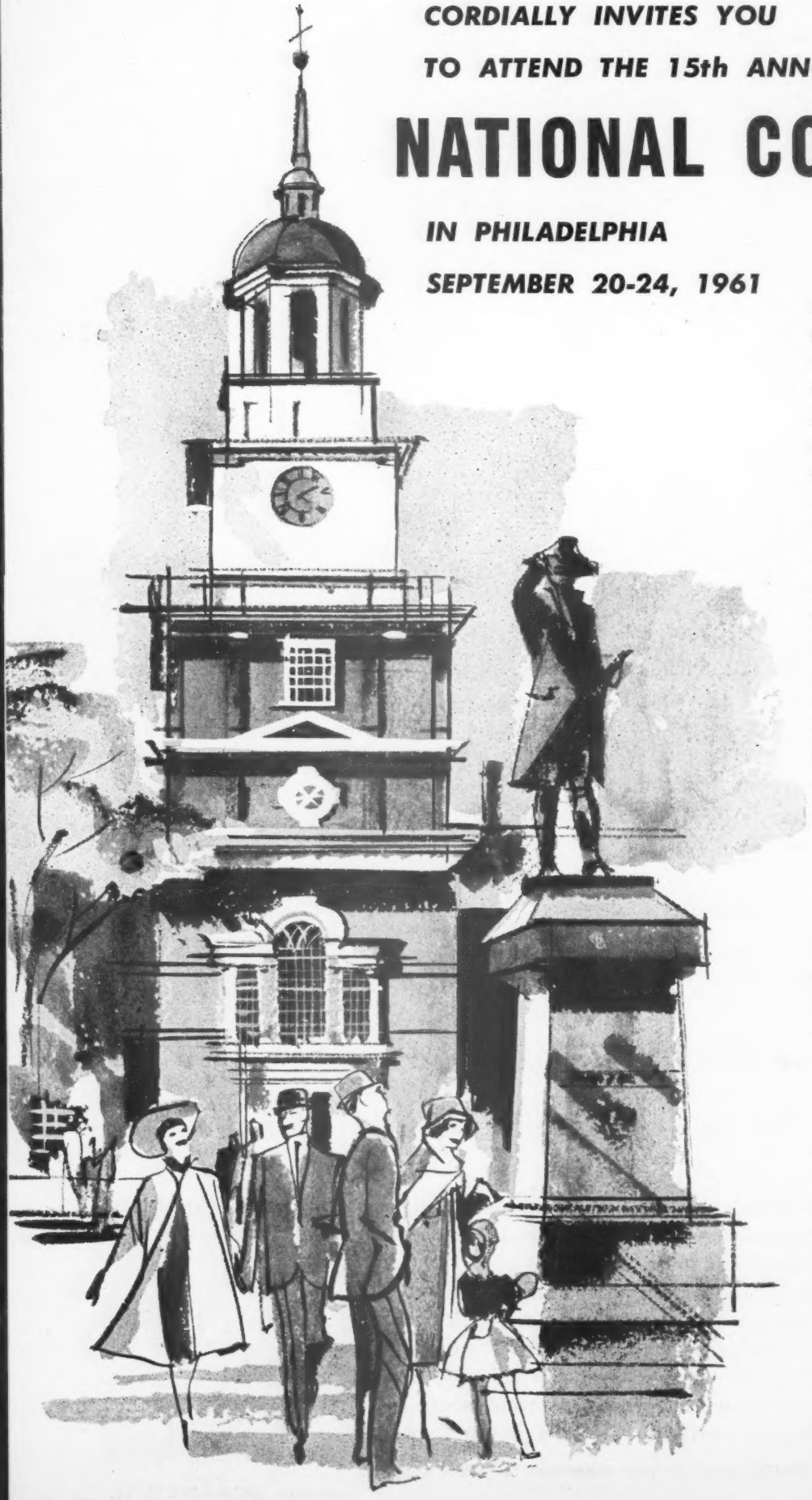
IN PHILADELPHIA

SEPTEMBER 20-24, 1961



GENERAL INFORMATION

Listed on opposite page are the names and rates of the official hotels and motels for the Air Force Association's 1961 National Convention and Aerospace Panorama, to be held in Philadelphia, September 20-24. Headquarters for the Convention and Panorama will be at Philadelphia's Convention Hall, where registration, major meetings, and banquets will be held. The AFA business sessions will be at the Sheraton Hotel. All of the hotels and motels are within 10 minutes by cab of the Convention Hall. All of the motor hotels listed on the other side are new. Additional motor hotels and lower rate hotels are available on request.

RESERVATION PROCEDURE

AFA has established a Housing Office at the Philadelphia Convention Bureau to handle all requests for rooms and suites for the Convention and Panorama. Requests will be confirmed on a first-come, first-served basis, beginning February 1. ALL requests for rooms and suites must be sent to the AFA Housing Office in Philadelphia at the address shown on the reservation form. Be sure to list THREE choices of hotels or motels, your arrival DATE and HOUR, and your departure date. The number of rooms and suites allocated at any one hotel to any individual or company will be limited by necessity. If you plan to arrive after 6:00 p.m., your reservation request must be accompanied by a written guarantee of payment.

and AEROSPACE PANORAMA

WATCH YOUR ARRIVAL TIME

Nothing is more important at a convention than your hotel room. Make sure that you give the Housing Office sufficient information to confirm the type of reservation you want, when you want it. Sometimes we receive complaints from persons who claim that they had a confirmed reservation but, when they arrived at the hotel, there was no record of it. In checking, we found that, in the majority of cases, the person had received confirmation of his reservation, but had later changed his arrival time and had failed to notify the hotel. If you change your arrival time in Philadelphia from that shown on your reservation confirmation, make sure that you notify the hotel; otherwise, your reservation will be CANCELED. Send all reservation changes to the hotel, and all cancelations to the Housing Office.

AFA HOTELS, MOTOR HOTELS, AND RATES

HOTEL	Single	Twin & Double	1 b/r Suite	2 b/r Suite
Adelphia	$ 6-10	$14-18	$25-35	
Barclay	$16-21	$16-21	$30-36	$54-60
Bellevue Stratford	$10-17	$14-23	$32-60	$52-80
Ben Franklin	$ 8-12	$11-18	$30-35	$45-53
Drake	$12.00	$14-18	$24.00	
John Bartram	$ 6-12	$ 9-16	$20-25	$40.00
Sheraton	$10-14	$16-18	$35-45	$42-68
Sylvania	$8.00	$12-15	$28.00	
Warwick	$12-15	$16-21	$32-42	$52-80

MOTOR HOTELS	Single	Twin & Double	1 b/r Suite	2 b/r Suite
Cherry Hill Inn	$11-14	$16-20	$29-50	$70.00
Franklin Motor Inn	$12.00	$16.00	$26-32	
Marriott Motor Hotel	$10-14	$14-20	$30.00	$50.00
Treadway Inn	$ 9-12	$13-16	$30.00	

IMPORTANT

Please complete this form in FULL and mail to the following address:

HOUSING OFFICE
AIR FORCE ASSOCIATION
HOSPITALITY CENTER
16th ST. & PENNSYLVANIA BLVD.
PHILADELPHIA 2, PENNSYLVANIA

Be sure to list *first*, *second*, and *third* choices of hotels and arrival DATE and TIME. If room is not available at rate requested, next nearest available rate will be assigned. For arrivals after 6:00 p.m., reservation requests MUST be accompanied by a WRITTEN GUARANTEE OF PAYMENT.

HOTEL RESERVATION FORM • 1961 AIR FORCE ASSN. CONVENTION
Philadelphia, Pennsylvania • September 20-24

TYPE OR PRINT

Date_____

Name_____ Rank, if Military_____

Firm/Organization_____

Mail Address_____

City & State_____

1st Choice Hotel _____ 2nd Choice Hotel _____ 3rd Choice Hotel _____

Type of Room—Be specific for double or twin room. _____ Desired Rate _____

Others Sharing Room _____

Arrival Date and Hour _____ Departure Date _____

NOTE: **For arrivals after 6:00 p.m., reservation requests must be accompanied by a written guarantee of payment.**

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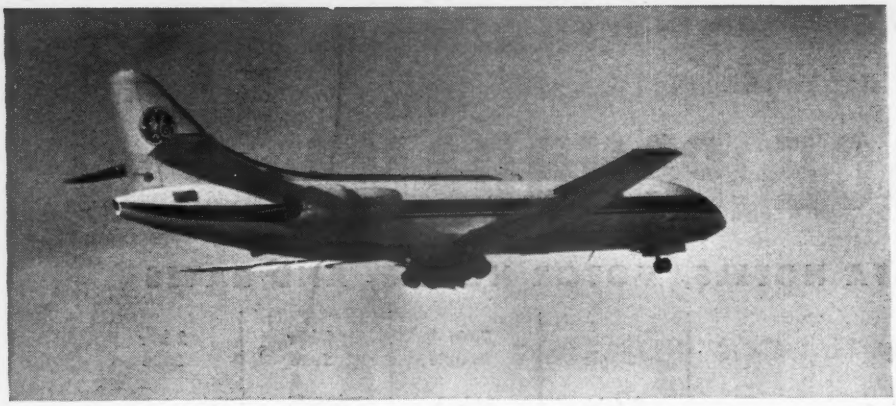


General Electric's Caravelle, equipped with CJ-805-23C aft-fan engines, completed its maiden flight Dec. 29. Production models are expected to be available in 1962.

G-E Caravelle Logs First Aft-fan Flight

EDWARDS AFB, Calif.—Fan-powered short/medium range jet airliners became a reality here Dec. 29 as General Electric's CJ-805-23C powered Caravelle completed its first flight.

The modified Caravelle III maintained an altitude of around 20,000 feet on its maiden flight of 1 hour and 25 minutes. Test pilot Dick Scoles reported that "the additional 40% take-off thrust of these fan engines was very noticeable. It shortened our take-off roll substantially and improved our acceleration and climb gradient. We also had the feeling that we had plenty of reserve power at cruising speeds."

Scoles added that he yawed the aircraft up to 10°, with no noticeable effect on fan speed.

General Electric took delivery of the aircraft from Sud Aviation last summer to demonstrate the performance of an aft-turbofan powered short/medium range jet airliner. Since October, the Caravelle's original turbojets and nacelles have been replaced with CJ-805-23C aft-fan engines and distinctive short-cowl nacelles, fabricated by Douglas Aircraft.

Aft-fan powered Caravelles are expected to be available for airline service in 1962. The production version of the CJ-805-23C powered aircraft will be called the Caravelle VII. Douglas will sell and service the Caravelle VII in the U.S. and in most other parts of the world.

For more details on the Caravelle VII, check GED-4176. See coupon.

NEA, TWA Begin Convair 880 Service

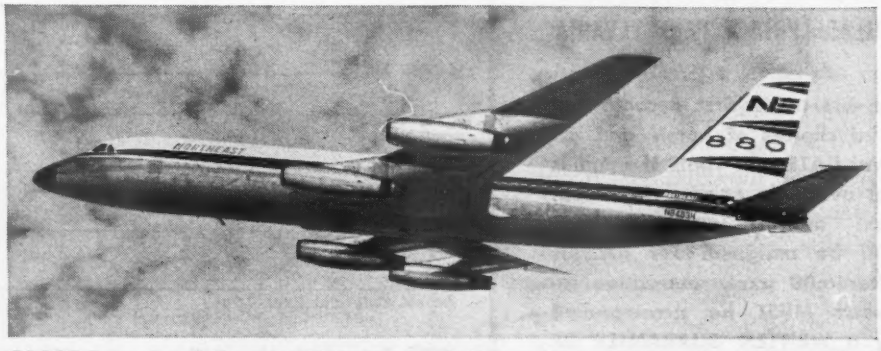
EVENDALE, O.—The G-E CJ-805-powered Convair 880 recently entered service with two more major commercial carriers as Northeast Airlines and Trans World Airlines introduced "the world's fastest jetliner" to their routes.

Northeast Airlines' first 880 set an unofficial "corner to corner" U.S. speed record during delivery Nov. 30, 1960. It flew from San Diego to Boston in 4 hours, 17 minutes. Earlier, a Delta 880 had set a speed record of 3 hours, 31 minutes from San Diego to Miami.

TWA began passenger service with the 880 Jan. 12, on routes between New York, Chicago, Las Vegas, Los Angeles, and Phoenix. Delivery of the balance of 24 airplanes will place the 880 on TWA routes throughout the U.S. NEA inaugurated 880 service on its Boston-Philadelphia-Miami run Dec. 15.

Powered by four CJ-805-3 engines, the 880 develops more than 44,000 pounds thrust. Engines are equipped with a clam-shell thrust reverser and ejector sound suppressor. Four G-E hydraulic constant speed drives operate in parallel to power the aircraft's 160-kva electrical system.

For more Convair 880/CJ-805-3 information, check GED-4192. For constant speed drive data, check GEA-6890. See coupon.



CJ-805-3 powered Convair 880 averaged 638 mph on 2,730-mile delivery flight to Northeast Airlines.

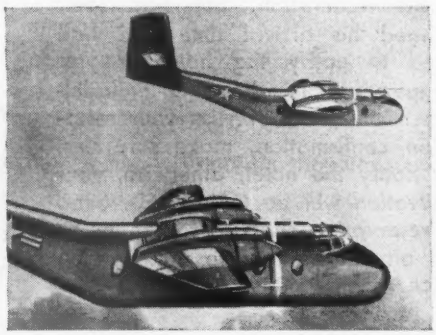
T64/de Havilland Caribou Flight Tests Set for May

LYNN, Mass.—A nine-month flight test program with General Electric T64 turboprop engines has been announced for the de Havilland DHC-4 Caribou STOL transport. The tests, slated to begin in May, will continue throughout 1961.

During the program more than 240 hours will be accumulated on two test engines. 20 hours of ground check-out and 100 hours of preliminary flight time are to be accomplished in first-phase testing. 300 hours of in-flight testing on each engine are scheduled to follow the initial test phase.

G.E.'s Small Aircraft Engine Department is responsible for installation and test engineering throughout the test period. Prior to flight test, inlet and prop tests are to be conducted at Lynn. The engine will log 7,000 hours of indoor testing before its maiden flight.

The T64 is available in four configurations—two turboprop, a turboshaft,



Twin T64s will power the Caribou STOL utility transport in a Navy-sponsored flight test program.

and a direct drive—for fixed-wing utility VTOL and STOL aircraft.

The T64 is one of the first gas turbines to match the low fuel consumption of reciprocating engines. At military power the turboprop version develops 2,700 horsepower and has a specific fuel consumption (SFC) rating of 0.495.

For additional details on the T64, check GED-4094. See coupon.

NEWS

A report about progress in research and products from the Flight Propulsion Division of the General Electric Company

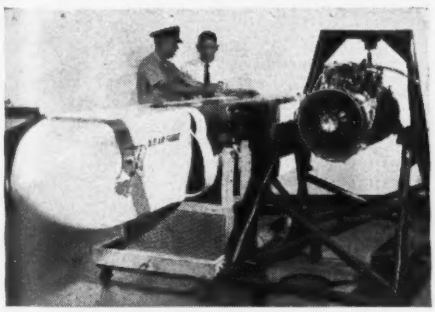
J85-powered GAM-72A Missile Completes Category I Tests

LYNN, Mass.—The GAM-72A "Green Quail," a decoy missile powered by General Electric's J85-7 turbojet engine, has completed Strategic Air Command Category I testing.

All flight tests with the G-E engine were successful. The 650-mph diversionary missile, designed and produced by McDonnell Aircraft Company, has been undergoing development and flight tests since 1959.

"Green Quail's" J85-7 turbojet powerplant develops 2,450 pounds thrust. Dropped in coveys by a B-52G mother ship, the missile is designed to confuse enemy air defenses by simulating the B-52 on enemy radar screens.

For more information on J85 turbojet engines, check GED-4095. See coupon.



The GAM-72A "Green Quail" decoy missile has completed SAC Category I testing. At the right is General Electric's J85-7 turbojet engine, which powers the 650-mph missile.

General Electric Offers Aft-fan Engine for Cargo Transport Aircraft

EVENDALE, O.—A new aft-fan engine, the 23,000-pound-thrust-class MF239-C-3, has been offered by General Electric to meet modern air cargo transport requirements.

Developed from G.E.'s proven CJ-805-23 aft-fan commercial engine, the MF239C-3 couples an advanced gas generator and a new "high power extraction" fan.

The MF239C-3 fan design incorporates a two-stage turbine/single-stage fan, aerodynamically coupled to the gas-generator compressor. The new fan provides a significant advance in turbofan development. It is expected to improve performance over earlier turbofans as they improved straight turbojet performance. Fan bypass ratio of 2.0 is optimum for a long-range, subsonic aircraft.

The coplanar exhaust, characteristic of aft-fan design, permits use of a quick-acting, clamshell thrust reverser to enhance short-runway performance. The reverser may also be used to modulate thrust in flight.

Present schedules call for production engines in mid-1963 with flight test engines available earlier.

For additional information on the MF239C, check GED-4260. See coupon.

North American A3J Claims World Altitude Lift Record

Decorated for their 17-mile ascent were Commander Leroy A. Heath, pilot, and Lt. Larry Monroe, navigator, of the record-breaking Vigilante. Commander Heath received the Distinguished Flying Cross, Lt. Monroe the Air Medal.

EDWARDS AFB, Calif.—The Navy's North American Aviation A3J Vigilante, powered by two General Electric J79 engines, on Dec. 13 filed a claim on the world altitude record for a land-based jet aircraft carrying a 1,000-kilogram (2,204.6 pounds) payload.

The claim, for an altitude of 91,450.8 feet, is now pending before the Federation Aeronautique Internationale (FAI). The Mach 2 Vigilante soared 24,354 feet over the previous record of 67,096 feet set in 1959 by a Russian twin-jet RV monoplane.

The A3J, first U.S. participant in this altitude test, has two J79 powerplants, providing more than 32,000 pounds of thrust. The engines weigh less than 3600 pounds each, to provide the highest thrust-to-weight ratio in their class.

To meet FAI requirements in this event, aircraft must carry 1,000 kilograms in a compartment measuring at least 141 cubic feet. On the record flight the A3J's payload was carried in the plane's tunnel-like linear bomb bay.

The J79-powered Vigilante, fastest attack aircraft in Navy history, is now undergoing flight tests prior to fleet assignment. Built for carrier operation, the all-weather A3J can deliver both nuclear and conventional weapons at twice the speed of sound.

FOR MORE DETAILED INFORMATION on these and other developments in General Electric products, contact your nearest G.E. Flight Propulsion Division representative or indicate below the free brochures you would like to receive.

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- ☐ GEA-6890 "Constant Speed Drive"
- ☐ GED-4094 "T64"
- ☐ GED-4095 "J85"
- ☐ GED-4176 "Caravelle"
- ☐ GED-4192 "880/CJ-805-3"
- ☐ GED-4260 "MF239C"

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News,
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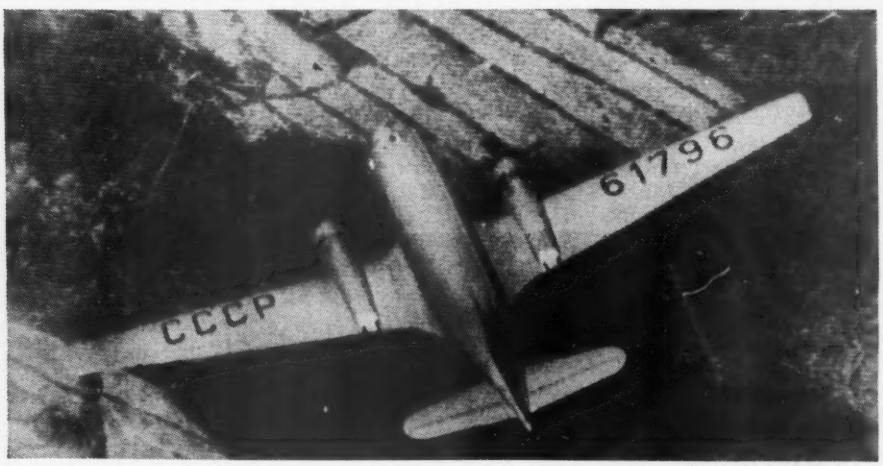
AEROSPACE WORLD

Frederic M. Philips
ASSOCIATE EDITOR, AIR FORCE MAGAZINE

Russia this month unveiled a new cold-war tactic, subversion by airlift. In the doing, Red airmen once again shot up an unarmed United States Air Force plane. The setting was the small, politically volatile jungle kingdom of Laos in southeastern Asia.

Communist rebels, often with outside help, have plagued successive Laotian governments for the past several years. The governments themselves have ranged from neutralist to strongly pro-Western. Rebel guerrilla activities erupted with new force in December after neutralist Premier Souvanna Phouma entered self-exile in neighboring Cambodia and a pro-Western Premier, Prince Boun Oum, came to power.



Wide World Photos, Inc.

Soviet subversion-airlift transport photographed over Laos. Communists shot up USAF Gooney Bird observing airdrops in support of Red rebel guerrillas.

It was at this point that Russia overtly entered the picture. Soviet IL-14 transports from mid-month on flew in and parachuted both supplies and Communist North Vietnamese reinforcements for the rebels. With this assistance, the antigovernment forces won a number of battles against loyal troops during seesaw fighting in December and the first half of January.

On January 3 the US State Department formally accused the Soviet Union and North Vietnam of these activities "in view of the seriousness of the situation" and declared it had "hard evidence" of 180 such flights in a two-week period. Among the exhibits for the prosecution were some very hard machine-gun bullets dug from the engine and fuselage of an Air Force Gooney Bird.

The C-47, assigned to the air attaché in the Laotian capital of Vientiane, came under fire on December 27 during one of a series of flights to observe the Soviet supply drops. The firing took place as the plane, Assistant Air Attaché Maj. Armand Reiser and a crew of four aboard, passed over an IL-14 at an altitude of 2,000 feet. The shots caused no injuries. Officially, the US took the position that they may have come from either the Soviet plane or rebels on the ground below. Unofficially, US sources in Vientiane said there was "not much doubt" that the IL-14 did the shooting.

As the month came to a close, virtual military stalemate in Laos was matched by free-world diplomatic stalemate over what if anything to do about the situation. The matter joined the catalogue of problems facing the incoming Kennedy Administration. What military force could the West immediately bring to bear if the need arose? One answer to the question was provided by Gen. Frank F. Everest, Commander of the Tactical Air Command, at the Air Force Association National Convention at Miami Beach back in September 1959. With Laos then on the verge of full-scale civil war, General Everest told newsmen that a USAF Composite Air Strike Force could reach there "within thirty-five hours" if ordered to do so. A member of his staff added that Laotian airfields "in range of targets" could accommodate US planes.

Project Mercury capsule recovered by Marine helicopter after test shot December 19 is lowered to deck of Navy aircraft carrier *Valley Forge*. It was first Mercury test success.

☆

Washington attorney **Eugene M. Zuckert** succeeded **Dudley Sharp** as

(Continued on page 29)

"Oxygeneering" ™ is a fusion of imaginative engineering and technical proficiency to solve equipment and systems problems raised by today's space age. ■ FAA required a crew mask suspension for constant, comfortable wear, to snap into position with a single gesture in emergency at high altitude. Sierra engineered the "Quik-Don" ™ approved by FAA under Regulation 40.203-T(c) in 'stand-by' status to 30,000 feet. ■ When you require imaginative engineering and advanced production techniques — contact Sierra.

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Mr. R. J. Shank, President (right), with Dr. R. E. Fagen (center) and Dr. R. B. Dawson (left) of the Information Sciences Division.

A Report from American Systems Incorporated...

A New Organization for Advanced Systems Technology

American Systems Incorporated was launched a year ago for research and development in the electronic systems field. With an across-the-board interest in systems technology, the Corporation has formed five Divisions:

ELECTROMAGNETIC SYSTEMS

Electromagnetic physics; electronic and mechanical scanning antenna systems; development and manufacturing of special microwave components; design, development, and manufacturing of complete sensor systems.

COMMAND AND CONTROL SYSTEMS

Logic of command and control complexes; systems design and development; data acquisition, processing and display; communications.

COMPONENT DEVELOPMENT

Advanced component technology; materials and processes; computer component development; chemical deposition of magnetic materials on drums, disks, rods, tapes.

INFORMATION SCIENCES

Mathematical and statistical research; computer programming, and development of advanced programming systems; computation services; digital system studies; logical design of military and industrial systems; advanced systems analysis.

RESEARCH LABORATORIES

Solid state physics and systems; thin-film research and subsystems; components for information processing.

We are gratified that the past year has been one of significant growth. Operations were started in a leased 10,000-square-foot building. Recently, we moved into our own 27,000-square-foot plant, on a 13-acre site in Hawthorne, California. This plant, which is the first unit in a long-range building program, has custom technical and scientific facilities, including an ultraclean laboratory for thin-film developments and advanced devices research projects.

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Secretary of the Air Force this month as the new Administration took charge in the nation's capital. His broad previous experience included service as Assistant Secretary of the Air Force and as a member of the Atomic Energy Commission. Mr. Zuckert was Special Assistant to then-Secretary of War for Air **Stuart Symington** in 1946. Then he became Assistant Air Secretary when Mr. Symington was appointed the first Secretary of the newly created Department of the Air Force in 1947.

While a member of the faculty of the **Harvard School of Business Administration** before World War II, Mr. Zuckert served as a consultant to the Air Force in developing statistical controls. He instructed some 3,000 Air Force officers in this field at Harvard and at bases throughout the country. In 1944 and 1945, he served as a Navy lieutenant (junior grade) in inventory control work. During ensuing service under Mr. Symington, Mr. Zuckert established the Air Force controller system, a system later adopted by the other services. *(For more on the appointment, see "Airpower in the News," page 17.)*

Mr. Zuckert (pronounced ZOO-kert) was one of an imposing crew of Kennedy Administration defense appointees headed by new Defense Secretary **Robert S. McNamara.** Among others chosen by mid-January were:

★ Deputy Defense Secretary **Roswell Gilpatric,** who was Assistant Secretary of the Air Force in 1951 and Undersecretary from 1951 to 1953 under then-Secretary **Thomas K. Finletter.** A New York attorney, Mr. Gilpatric was a member of the committee headed by Senator Symington that recently recommended a major reorganization of the Department of Defense. He also served in the **Rockefeller Report study group** in 1956 and 1957. During the second World War, Mr. Gilpatric worked primarily with war production contract matters in connection with Air Force and Navy aviation. He has been chairman of the board of trustees of the **Aerospace Corporation,** the newly formed nonprofit organization that assists the Air Force in space and missile programs. Mr. Gilpatric succeeded former AF Secretary **James H. Douglas** as Deputy Defense Secretary.

★ Assistant Secretary of Defense for International Affairs **Paul H. Nitze,** former State Department policy planner who held key government posts from 1941 to 1953. He was vice chairman of the **Strategic Bombing Survey** from 1944 to 1946, when he joined the State Department and was one of the architects of the Marshall Plan. Mr. Nitze was president of the **Foreign Service Educational Foundation** before his appointment, also served as an adviser to the **Gaither Committee** on national strength in 1957.

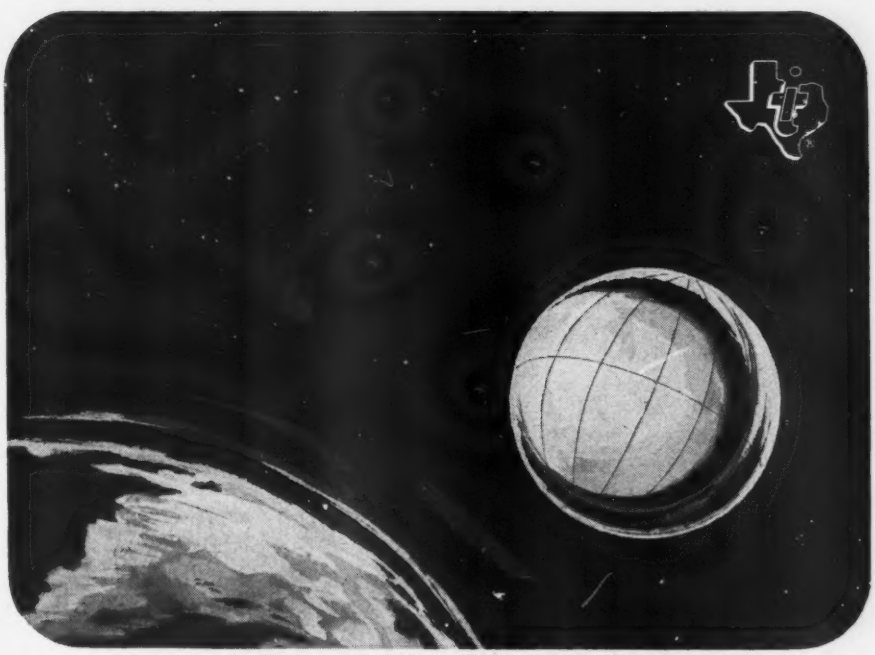
★ Secretary of the Navy **John B. Connally, Jr.,** Fort Worth attorney, naval veteran, former administrative assistant to then-Senator and now Vice President **Lyndon B. Johnson.** He succeeded **William Franke** as Navy Secretary.

★ General Counsel of the Defense

(Continued on page 31)

Wide World Photos, Inc.

B-52H was rolled out at Boeing's Wichita plant in early January. Hung under its wings, two on each side, were test models of Douglas Skybolt ALBM. The plane, turbofan powered, will have greater range than B-52G planes in service.



TI electronic flight control in Douglas Aircraft's Delta launch vehicle helped orbit the NASA communications satellite ECHO I.

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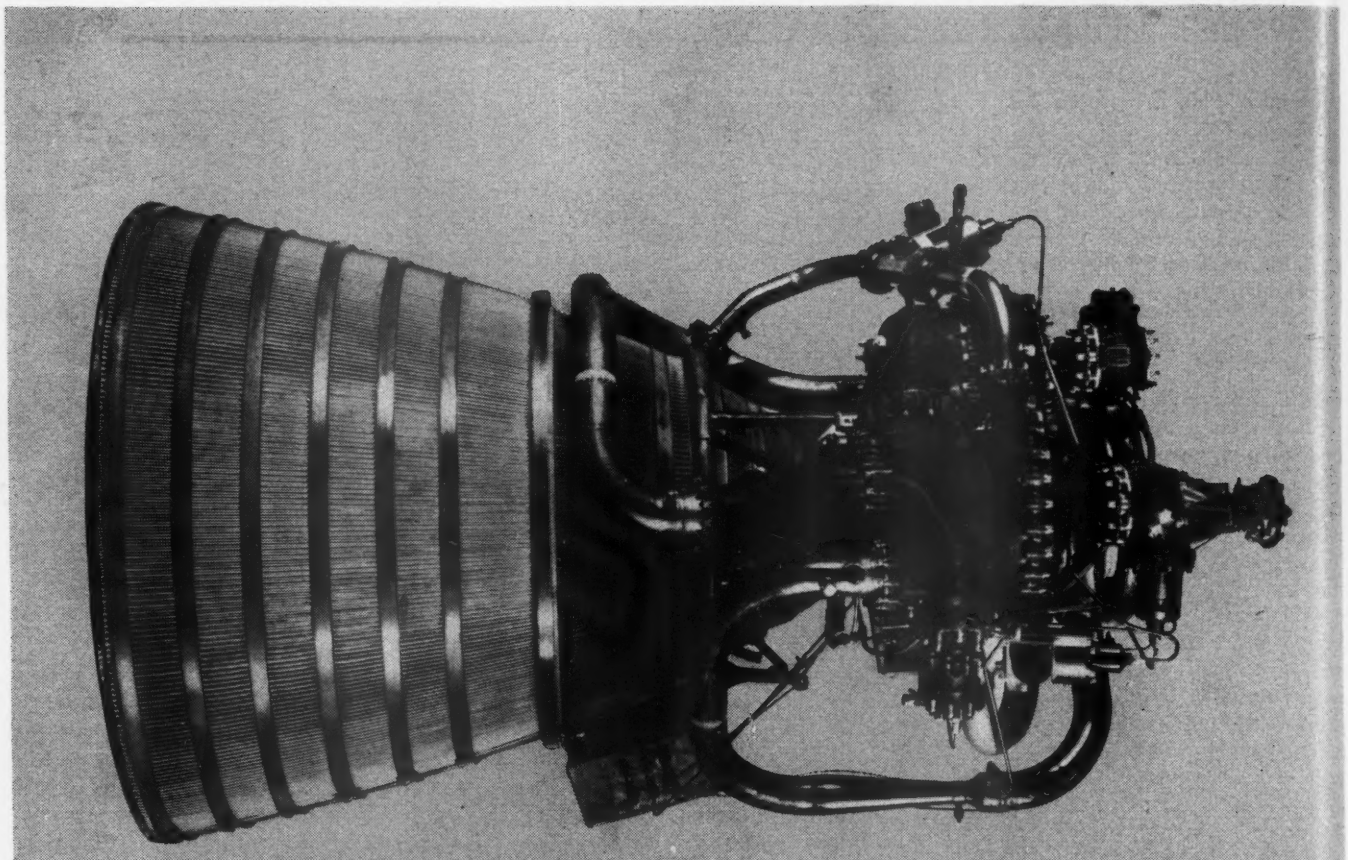

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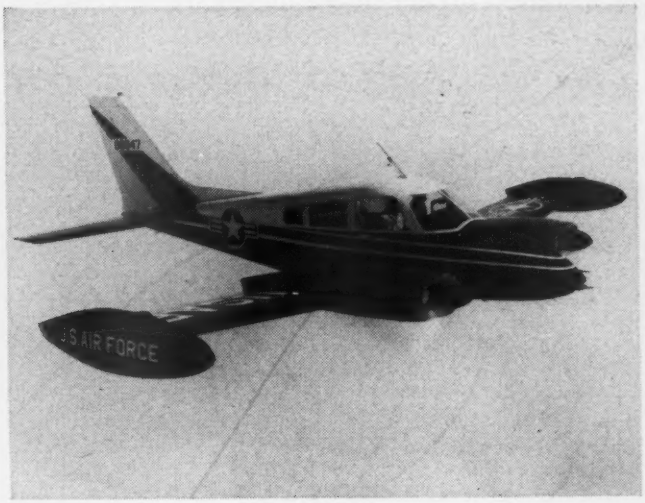
Navy Lt. Henry L. Monroe, left, and Cmdr. Leroy A. Heath stand before North American A3J Vigilante jet in which they hauled 2,204-pound payload to altitude of 91,450.8 feet on December 13 at Edwards AFB, set new world mark.



New Air Force U-3B in inspection flight over state of Kansas before Cessna delivers it to SAC. Thirty-five of the planes, improved versions of U-3A for administrative, light cargo missions, are currently on order for USAF.

Department **Cyrus R. Vance,** New York attorney who was a counsel to the **Senate Armed Services Committee** and the **Special Senate Space and Astronautics Committee** during the past three years. Mr. Vance succeeded **J. Vincent Burke** in his new post. He served in the Navy during the second World War.

Assistant Air Force Secretary (Comptroller) **Lyle Garlock** and Undersecretary **Joseph D. Charyk** were reported almost certain to remain in office at least for the time being under Mr. Zuckert. It was judged likely, as well, that General Counsel **Max Golden** and Administrative Assistant John J. McLaughlin would stay on. Serving with Mr. Zuckert in an information and legislative affairs capacity was to be former AEC official **Edward R. Trapnell.**

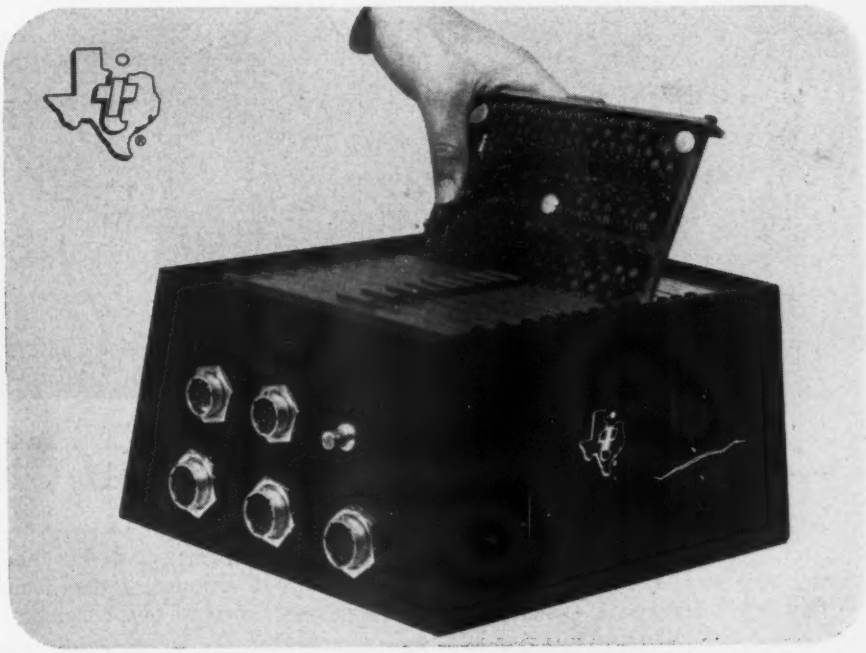
In another important personnel development, **Vice President Johnson** was named chairman of the **National Space Council,** a potentially important advisory group set up in 1958. The outgoing Administration proposed abolition of the council last year, but the move was blocked by Senator Johnson's Senate Space Committee.

☆

Before this new year comes to an end, the United States hopes to send **one of its seven Mercury Astronauts** on an orbital flight around the earth. A successful space-capsule launch and recovery on December 19 hastened the day. Up 135 miles and out 235 miles from Cape Canaveral, boosted by an **Army-developed Redstone rocket,** went an unmanned NASA man-in-space capsule. Sixteen minutes after launch the one-ton bell-shaped capsule paradropped into the Atlantic eight miles from the waiting Navy aircraft carrier *Valley Forge.* Twenty minutes longer and a Marine Corps helicopter deposited it **safely on the ship's deck.**

This was the first successful shot in the **Project Mercury test series.** Last failure was on November 21, when the booster cut off. Plans after this "unqualified success" called for sending a **chimpanzee** on a similar short haul in January and an Astronaut over the same route about three months there-

(Continued on page 33)



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after. Orbital flights would follow, probably making use of more powerful USAF-Convair Atlas boosters. The quick and neat recovery on December 19 was the most heartening event of the US space program since recovery of capsules from orbiting USAF Discoverer satellites began to become routine in August of 1960. Without recovery capabilities, there can be no man-in-space program. The rule does the law of gravity one better: What goes up must come down—safely.

The successful Mercury test shot was the top hardware news of a month in which the Air Force also blasted another Discoverer into orbit and a Navy jet attack plane set a new world payload-to-altitude record.

Discoverer XIX was launched from Vandenberg AFB, Calif., on December 20, the day after the East Coast Mercury shot, by a compound **Douglas Thor-Lockheed Agena rocket.** The satellite carried with it heat-sensing devices of the sort that will provide the infrared eyes of **future Midas missile-defense alarm system satellites.** It was equipped with a radio battery-powered for four days' operation. Unlike many of its predecessors, **Discoverer XIX** had no recoverable capsule.

Navy **Cmdr. Leroy A. Heath** and **Lt. Henry L. Monroe** took their **North American A3J Vigilante jet** and a payload of 2,204 pounds to an altitude of **91.450.8 feet,** about seventeen miles, over Edwards AFB, Calif., on December 13. Previous altitude record with this payload was **67,096 feet** set by **Russian pilot Vladimir Smirnov** in a twin-jet monoplane. Altitude record for a ground-launched plane, 103,395 feet, was set in December 1959 by USAF **Capt. Joe B. Jordan** in a Lockheed F-104. USAF's **Maj. Robert M. White** rode the air-launched X-15 rocket craft to 136,500 feet last August. The impressive December 13 A3J flight marked the first US attempt at the international ton-to-altitude mark.

Also on the hardware front:

★ A USAF **Atlas** with a TNT warhead negotiated the distance from Vandenberg AFB to Eniwetok lagoon, **5,041 miles** across the wide Pacific, in twenty-seven minutes on December 17, landing bang on. It was a SAC exercise to test components and train crewmen.

★ The second stage of a near-operational **Titan ICBM** failed to ignite and the bird plunged into the sea off the Cape on December 20.

★ The Navy nuclear submarine *Robert E. Lee* fired an advanced A-1 version of the **Polaris** IRBM **1,300 miles** in an Atlantic shot December 22.

★ The new longer-range **turbofan-powered B-52H** bomber rolled out at the Wichita, Kan., Boeing plant on January 5. Under each wing were tucked two test models of 1,000-mile-range **Douglas Skybolt** air-launched ballistic missiles. Current B-52G bombers carry 500-mile-range North American **Hound Dog** air-launched missiles.

The **Military Air Transport Service** at the same time ordered sixteen **C-130E Hercules** propjets from Lockheed. First aircraft was due for delivery in March 1962. Total order over a two-year period was expected to reach **fifty planes,** adding increased speed, range, and versatility to the MATS strategic airlift fleet. The Air Force also has invited bids for a strategic pure-jet cargo plane.

☆

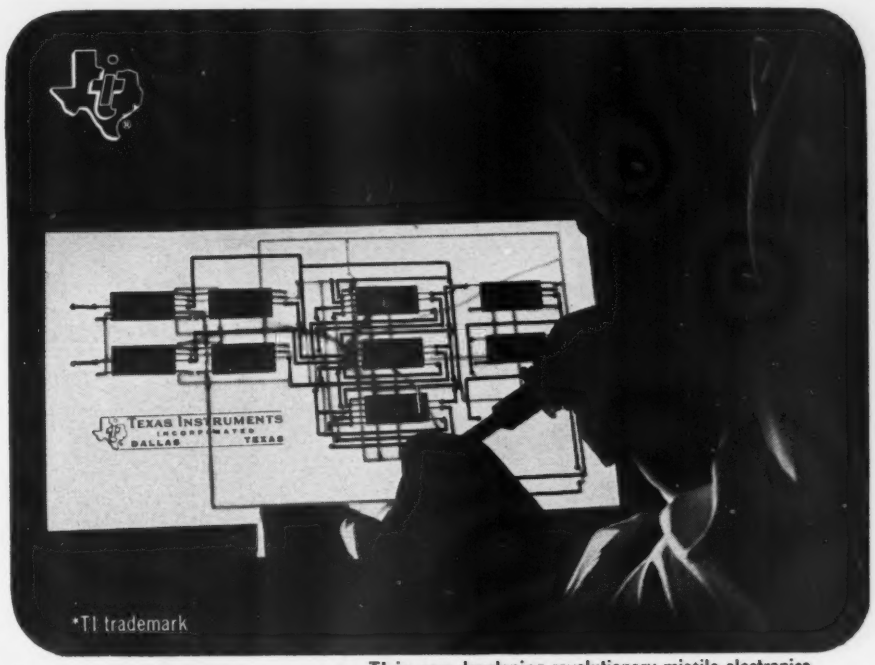
What kind of officer will lead **tomorrow's Air Force?** A recent issue of the *Airpower Historian,* published by the Air Force Historical Foundation, had this to say on the subject in "A Message to Young Officers:"

"Change in the civilization of our century has been as dazzling and as fundamental as that which took place in the age of the Renaissance. Consider Descartes' analytic geometry and scientific methods, Galileo's experimental science and mathematics, Newton's physics, Grotius' law; or even earlier in ancient Greece, Socrates, Plato, and Aristotle ordering the universe for the mind of man to accommodate the growing civilization. The impact of physical science on our times is even more vivid due to the compression of time. The magic has been performed before our eyes.

"Less apparent, however, are the new imperatives of command and leadership which tomorrow's ordering of the universe requires. For the Air Force, with its military mission and its challenge, a blue suit capability of leadership is vital to give direction and purpose to science and engineering in the service of the nation. . . .

"If the Air Force is to develop this leadership for the new challenge, the characteristics of individual officers in

(Continued on page 35)



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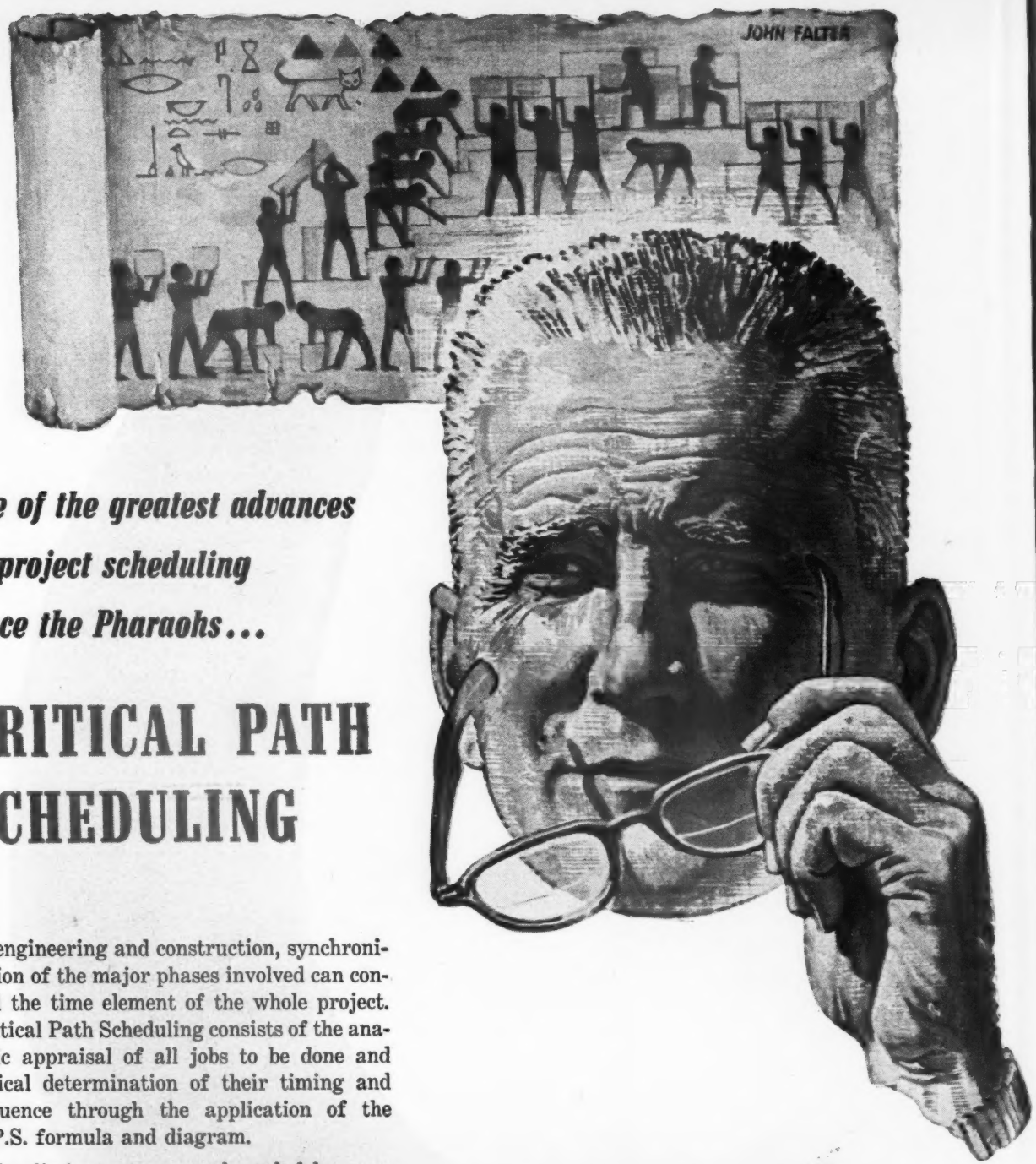

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the corps must be changed. In addition to the customary attributes of being an officer, there is imposed a new demand—that of an intellectual understanding of the forces of science which are to be employed to accomplish the mission. This intellect, again, is but a new instrument to be used in the old art of command. . . .

"How do you acquire the intellectual qualities for tomorrow's command? You do this by developing your mind in an orderly and systematic manner either on your own or, more readily, through higher education. In recognition of the demands placed upon you, the Air Force sends hundreds, even thousands, of young officers to the universities of this nation to develop their intellectual capabilities. Realizing this, you should carefully monitor your own career, making sure that you gain experience on the job for two or three years, and then advance your education to the graduate level, and repeat this process in developing and programing toward higher levels of staff and command. . . .

"Promotions and other rewards in the Air Force have always gone to those who carry the primary mission load. Consequently, the bulk of future promotions will go to those who are carrying the space age mission load. The same is true of prestige. The mystery of science, the awesomeness of the missile, and the challenge of space are already hammered into a badge of honor for the officer engaged in science and engineering, either in the laboratory, in development, in operations, or in command. . . ."

☆

ELSEWHERE IN THE AEROSPACE WORLD:

It was widely speculated through the month that the decision to cut the **number of service dependents overseas** to save gold would be rescinded or at least eased considerably.

USAF Lt. Col. J. B. Swindal has been chosen by the service as President Kennedy's personal pilot. President Eisenhower's pilot, Col. William G. Draper, was transferred to a fighter unit in Alaska.

France exploded its **third nuclear test device** in the Sahara Desert on December 27. The first two were detonated early in 1960. At the same time, the NATO nations took under study a US proposal to provide nuclear subs and Polaris and Pershing missiles to the alliance.

On the same day, December 27, **Belgium, Italy, West Germany, and the Netherlands** signed an agreement with the US for **production of F-104G fighters** abroad, the overseas allies bearing most of the cost.

Ellsworth AFB, S. D., was named in early January as the **third Minuteman support base.** First base will be **Malmstrom, S. D. Hill AFB,** Utah, will support mobile Minuteman units.

A committee of retired general and flag officers headed by **Gen. Charles Bolte,** USA (Ret.), presented a report to DoD calling for **extensive officer personnel changes.** Among numerous recommendations: set up a **single all-service promotion list,** equalize number of **flag and general officers** in each service according to its size. USAF would lose **five general officer slots,** Army **twenty-five,** Navy **remain unchanged.**

Frank Coffyn, 82, aviation pioneer and associate of the Wright brothers, died in Palo Alto, Calif., on December 10 of a heart attack.

MIT Professor H. Guyford Stever, who was Chief Scientist of the Air Force in 1955 and 1956, has been elected President of the **Institute of Aerospace Sciences,** New York.

A Wright-Patterson AFB civilian scientist, **James K. H. Gebel,** has received a $5,000 incentive award for invention of the ultrasensitive "Cat Eye" optical amplifier for use with telescopes and other optical systems.

First prize of $350 in the eleventh annual **USAF Short-Story Contest** went to **MSgt. John R. Prager,** Lackland AFB, Tex., for his story "The Disabling Trophy." Second prize, $250, went to **Lt. Col. Joseph F. Mazy,** Hq. Alaskan Air Command, for "Matsuo the Dishonored." **A3C Paul D. Riley,** USAFE, won third prize, $150, for "One of the Bayvril Girls."

STAFF CHANGES . . . . **Maj. Gen. J. Stanley Holtoner,** from Assistant to Director of Defense Research and Engineering, OSD, to Air Force Member, Joint Strategic Survey Council, Office of the Joint Chiefs of Staff, Washington, D. C. . . . **Maj. Gen. Herbert B. Thatcher,** from Air Force Member, Joint Strategic Survey Council, to Special Assistant to the Joint Chiefs of Staff for Disarmament Affairs, Washington, D. C.

RETIRED. . . . Maj. Gen. Herbert L. **Grills,** Maj. Gen. Albert G. **Hewitt.**

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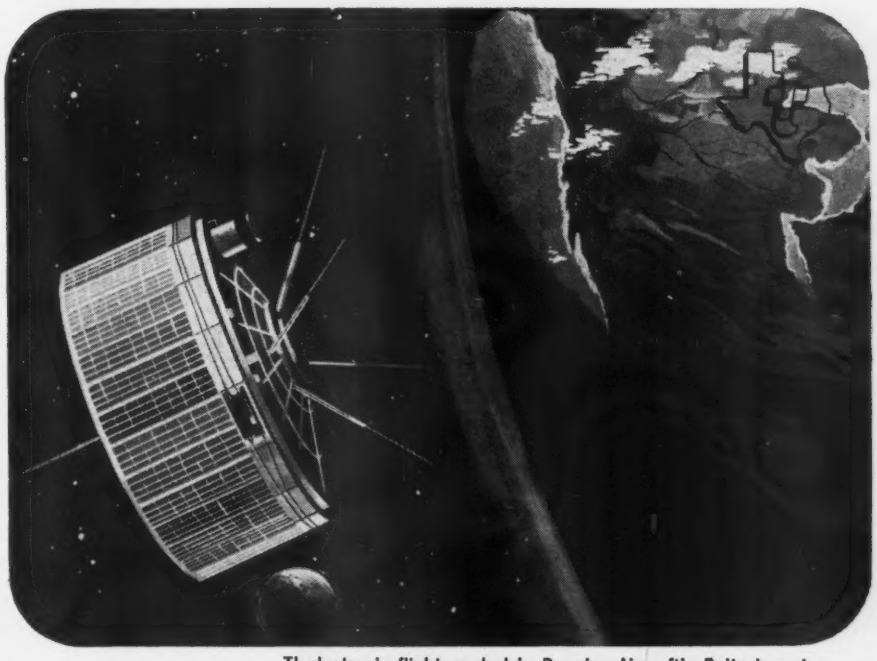

TI electronic flight control in Douglas Aircraft's Delta launch vehicle helped orbit the NASA weather satellite TIROS II.

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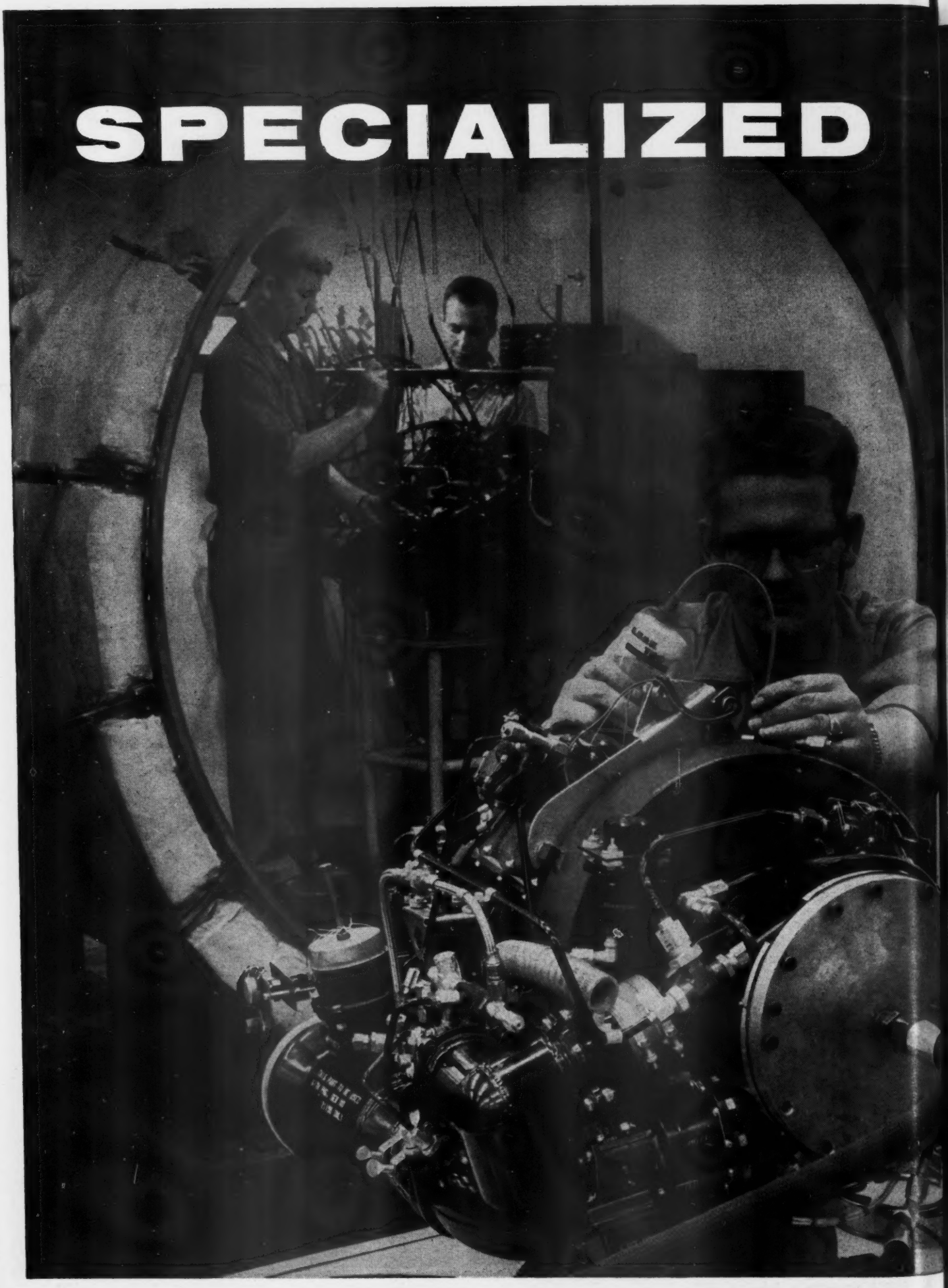
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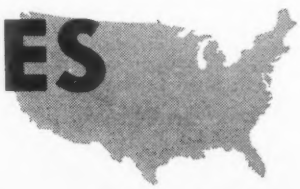
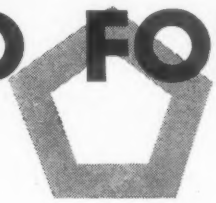
FEBRUARY 1961

Three major facts emerge from an examination of defense reorganization proposals and compromises of the past . . .

- ★ **No major study group of national stature that has examined the defense reorganization problem since World War II has ever recommended *less* unification than existed at the time the study was made.**
- ★ ***Every* major reorganization proposal has been met with essentially the same gloomy prophecies of the dire results that would transpire should they be accepted.**
- ★ ***None* of these dark forebodings has ever come to pass, although there has been steady progress toward a more unified military establishment.**

STATES UNITED ARMED FORCES





Why Not?

John F. Loosbrock
EDITOR, AIR FORCE/SPACE DIGEST

AS WAS to be expected, the proposals of the Symington Committee on defense reorganization (AIR FORCE, January '61) have thus far generated a good deal more fission than fusion. The stock arguments have been raised against them with little regard for past history, present requirements, or future technology. Hence it would appear useful, at this juncture, to place defense reorganization in historical perspective as a possible antidote to the emotional hysterics that characterize those who say that all is right with the Pentagon and that the nation can indefinitely afford the luxuries of three (or more) of everything that pertains to defense.

This study is based upon, and draws at length from, a much longer and more scholarly paper prepared by Dr. Harry Howe Ransom, of the Defense Studies Program at Harvard University. We are deeply indebted to Dr. Ransom for permission to make extensive use of his work, which is to be part of his forthcoming book on national defense and democratic government. The opinions and conclusions, however, are entirely our own.

In preamble, we would like to highlight three major facts that emerge from an examination of defense reorganization proposals and compromises of the past:

1. No major study group of national stature that has examined the defense reorganization problem since World War II has ever recommended *less* unification than existed at the time the study was made.

2. *Every* major reorganization proposal has been met with essentially the same gloomy prophecies of the dire results that would transpire should they be accepted.

3. *None* of these dark forebodings has ever come to pass, although there has been steady progress toward a more unified military establishment.

In the context of this discussion, the history of unification begins shortly before World War II. In 1941, both the Army and the Navy began to show interest in a defense organization that would provide a single Department of Defense and a Joint Chiefs of Staff organization. Navy interest quickly evaporated as the dangers of centralization to Navy autonomy became quickly evident. But the War Department, beginning actively in 1943, became the advocate of a highly centralized system.

Early proposals included a powerful Defense Secretary, a single Chief of Staff with a general staff to serve him, and virtual elimination of separate single secretaries for the armed services—the latter to include an independent Air Force.

Among the more ardent proponents of such a system were Gen. George C. Marshall, Secretary of War Henry L. Stimson, and Gen. Dwight D. Eisenhower.

His wartime experiences had convinced General Marshall, in his words, that "even under the stress of war, agreement has been reached in the Joint Chiefs of Staff at times only by numerous compromises and long delays, [and] local service enthusiasms become a source of weakness instead of a source of strength."

From 1943 until 1947 the debate raged. Committees in both the legislative and executive branches studied and recommended. Always the Navy, fearing the loss of the Marine Corps and naval aviation, was the principal foe of armed service unification proposals. The basic issue was the degree to which both the civilian and military authority would be centralized for strategic planning, force levels, and assignment of service roles and missions. Both the Army and the Air Force consistently supported a centralized approach. But the Navy held firm.

Over the years, in fact, proponents of unification have often faced a situation amusingly described by President Roosevelt, quoted in Richard Neustadt's book *Presidential Power.* Roosevelt once remarked:

". . . The Treasury and the State Department put together are nothing compared with the Na-a-vy. The admirals are really something to cope with—and I should know. To change anything in the Na-a-vy is like punching a feather bed. You punch it with your right and you punch it with your left until you are finally exhausted, and then you find the damn bed just as it was before you started punching." (The original quote is from the book, *Beckoning Frontiers,* by Marriner Eccles.)

During this period—1943-1947—there was wide public support for any measures that promised increased economy and efficiency in the Pentagon. But the key to the opposition to true unification lay on Capitol Hill. There, determined resistance to unification came, as it still does today, from a small but powerful minority in each house. The upshot was compromise legislation, strongly influenced by a carefully worked-out plan commissioned by Secretary of the Navy James V. Forrestal and developed under the aegis of Ferdinand Eberstadt.

Highly significant but often overlooked are the words—including some between the lines—of the "Declaration of Policy" which served, in effect, as a preamble to the National Security Act of 1947 which first established the National Military Establishment, later, in 1949, to become the Department of Defense.

This part of the statute expresses the "intent of Congress"—with deliberate and significant ambiguity. The major portions are as follows:

1. It expressed congressional intent to provide a "comprehensive program" and "integrated policies and procedures" for national security, BUT . . .

It provided also for three departments "separately administered, for the operation and administration of the Army, the Navy (including naval aviation and the United States Marine Corps), and the Air Force. . . ."

2. These departments were to be under "authoritative coordination and unified direction" by a civilian Secretary of Defense, BUT . . .

The Secretary was "not to merge them."

3. Finally, the intention was expressed "to provide for the effective strategic direction of the armed forces and for their operation under unified control and for their integration into an efficient team of land, naval, and air forces. . . ." BUT (added in 1949) . . .

"Not to establish a single Chief of Staff over the armed forces nor an armed forces general staff." And the Secretary of Defense was specifically forbidden from maintaining a military staff.

From this planned ambiguity have stemmed a good many of the problems which still plague our military effort. How to supply simultaneously "integration" and "separation"; "unified direction" but not "merger"; strategic "integration," without a unified staff, has puzzled many a Secretary in the years that have intervened.

Thus, the Unification Act of 1947 was clearly a compromise, with the Navy retaining its internal monolithic structure by raising the bugaboo of a "monolithic" Defense Department.

Mr. Forrestal, the chief architect of the Act, became the first Secretary of Defense. Oddly enough, his first annual report called for a strengthening of his office and for greater centralization of power than he, as Secretary of the Navy, had been willing to allow the Secretary of Defense to have. His recommendations, plus those of the Hoover Commission task force, prompted a further reorganization in 1949.

The 1949 amendments further diluted service autonomy:

1. The individual departments lost their cabinet status, including their seats on the National Security Council.

2. The word "general" was taken out of the phrase giving the Secretary of Defense "general direction, authority, and control" over the departments.

3. The clause reserving to the departments those powers not specifically granted to the Secretary of Defense was deleted.

4. BUT roles and missions could not be transferred, reassigned, abolished, or consolidated; and Congress was to be kept informed of other consolidations.

The next major change came in 1953, after the Korean War and a change of Administration. Many were unhappy about the way the Defense Department had functioned during Korea. There had been a rapid turnover of Secretaries—Louis Johnson, Gen. George C. Marshall, and Robert A. Lovett. In leaving his post, Mr. Lovett gave President Truman a detailed and highly critical letter about his department's organization. He wanted more authority for the Secretary and improvement in planning processes.

The new Administration appointed a committee, headed by Nelson Rockefeller, to study and recommend. The Rockefeller group's report resulted in transmittal to Congress of Reorganization Plan No. 6 of 1953. Some of the proposed changes were described as "terrifying" by Mr. Eberstadt. The Navy League continued to warn of dangers to our form of government. Free enterprise and the capitalistic system were threatened, ran the stories, and there was an unsuccessful congressional attempt to block the plan.

But the 1953 reorganization further chipped away at service autonomy:

1. The power of the Chairman of the Joint Chiefs was strengthened, including the responsibility for man-

(Continued on following page)

agement of the JCS and discretion as to selection of membership.

2. Various triservice boards and agencies were abolished.

3. The number of Assistant Secretaries of Defense was tripled, with specific executive functions.

But these measures were not substantive, and the debate wore on from 1953 to 1958. Technology continued to challenge traditional concepts and to aggravate the competition for dollars, weapon systems, and missions. Arguments as to organizational structure became entwined with the continuing quarrels over "what kind of forces for what kind of war." Added to these pressures for change were the rising cost of weapon systems; public shock at Soviet technological progress; fiscal ceilings which permitted one service to progress only at the expense of another.

The Pentagon structure had been sharply criticized by many individuals and influential groups such as the Rockefeller Brothers' Fund Report, the reorganization portion of which was collaborated on by Roswell Gilpatric, Gen. Lucius Clay, and Gen. Alfred Gruenther.

The still-secret Gaither Committee report is also supposed to have hit hard at Pentagon organization.

Following a 1957 White House-Pentagon study chaired by former Assistant Secretary of Defense Charles A. Coolidge, President Eisenhower ordered some important organizational changes by presidential directive, and others were incorporated in Pentagon-drafted legislation submitted to Congress. Here the Administration bill was quickly countered by another sponsored by a bipartisan group of opponents of centralization.

In brief, the Administration position called for even more authority for the Secretary of Defense in strategic planning, in administration, and in military operations; for greater unification of strategic and tactical planning; for using the device of unified field commands to implement the concept voiced by President Eisenhower that "separate ground, sea, and air warfare is gone forever."

The congressional proposals jealously guarded the application of divergent service views to defense decisions; its own "coequal" responsibility for defense matters; a continuing prohibition of either any service merger or a single chief with a general staff.

Again, the case was settled out of court, by compromise. But longer steps were taken in the direction of real unification than at any time since the original act of 1947.

The principal results of the 1958 reorganization (by both executive directive and statute) were:

1. Lines of Command:

- Commanders of unified (*e.g.* Pacific) and specified (*e.g.* SAC) commands were given full operational control over forces assigned to them.
- Lines of command were clarified—from the Commander in Chief through the Secretary of Defense (advised by the JCS) to the unified or specified commanders. The service secretaries and service chiefs were taken out of the chain of command except that the latter, as members of the Joint Chiefs, would be involved in issuing strategic directives in the name of the Secretary of Defense.
- The individual services remained charged with organizing, training, and equipping forces for the operational commands and for administering and supporting forces so assigned.

2. Secretarial Authority:

- Secretarial authority was strengthened, although the attempt to give him "greater flexibility in money matters" ran into a stone wall on Capitol Hill.
- The service departments were no longer required by law to be "separately administered" but simply "separately organized," and came under the clearly stated "direction, authority, and control" of the Secretary.
- The Secretary could propose to reassign, transfer, consolidate, or abolish major combatant functions (in effect roles and missions), subject through specified procedure to congressional veto. Other functions, such as services and supply, could be reassigned at the Secretary's discretion.
- The service secretaries became responsible to the Secretary of Defense for the efficient operation of their departments. Orders to the departments would be issued through the service secretaries or the Defense Secretary's various deputies (including assistant secretaries) but only under authority specifically delegated in writing by the Secretary.
- The Joint Chiefs, as a corporate body, became "directly responsible" to the Secretary of Defense.
- The Secretary of Defense was to give the President nominations for three- and four-star rank, with "suggestions" from the service secretaries and "advice" from JCS.
- The post of Director of Defense Research and Engineering was created under the Secretary of Defense with statutory authority to be his principal adviser on scientific and technical matters; to supervise all research and engineering in DoD; and to direct and control, assign or reassign any research and engineering activities the Secretary thought needed a central management.
- And the Secretary of Defense could assign any new weapon system, regardless of which service might have developed it, to any service for production, procurement, and operational control.

3. JCS and Joint Staff:

- Size of the Joint Staff was raised from 210 to 400.
- The JCS Chairman, instead of the JCS, would select the Director of the Joint Staff, in consultation with JCS and with approval of the Secretary.
- The enlarged Joint Staff was reorganized, with a J-Staff setup (J-1, J-2, etc.) replacing the old interservice committee system. J-3, of course, became a new, integrated operations division, significant because the JCS assumed, as staff for the Secretary, strategic direction of the unified field commands.
- On the negative side, Congress stipulated that

the new Joint Staff "shall not operate or be organized as an over-all Armed Forces General Staff and shall have no executive authority." A three-year limit was placed on Joint Staff service.

- The individual Chiefs were authorized to delegate to their Vice Chiefs such duties and authority as might be necessary to give the Chiefs more time for their JCS responsibility.

4. Roles and Missions:

- The law specifically provided for continuation of the Departments of the Army, the Air Force, and the Navy ("including naval aviation and the United States Marine Corps"). Although the authority of the Secretary of Defense in the "unified direction" of the departments was increased, Congress reiterated its intention "not to merge these departments or services." The departments were to remain "separately organized," and the authority of the Secretary to alter major combat functions was, as stated above, subject to congressional veto. Thus roles and missions remained as muddled as before, except for the effect of the strengthened unified command system on the independence and command functions of the chiefs.

Two additional provisions of the 1958 reorganization might be noted here:

- The right of service secretaries and service chiefs to make recommendations on their own initiative to Congress was specifically reaffirmed, and:
- A grant of statutory status to the National Guard Bureau and its chief was made.

With these and other changes which space does not permit us to elaborate upon, the Reorganization of 1958 was, as described in this magazine, "the most vigorous and imaginative step yet made in these directions [toward true unification] by the Executive Department." *Navy* Magazine, published by the Navy League, called it "another step toward a more highly centralized Department of Defense. The groundwork, through doubling the size of the Joint Staff, is laid for what could become, if not carefully watched by Congress, a supreme high command."

Here, essentially, is where the matter rests at the moment. Defense organization remains a compromise between the concept of unified strategic planning and centralized administration of the armed forces on the one hand, and on the other, a traditional, carefully guarded preservation of independent missions assigned to semiautonomous, separately organized services, based upon the concept of sharply defined land, sea, and air functions.

In passing, it is impossible to resist the temptation to comment on the incongruity of the salt-encrusted Navy position in the unification matter. Horny-fisted opponent of unified control over all the armed services—whether they walk, fly, shoot missiles, or sail on or under the seas—the Navy finds no contradiction in the fact that it has its own fleet, its own air force, its own army, its own missiles. Indeed, it is undoubtedly its own self-sufficiency which makes the Navy so content with things as they are, and even more content with things as they used to be.

There is more than a laugh in Adm. "Bull" Halsey's one-time remark to Gen. "Hap" Arnold: "Just bring your strategic bombers into the Navy and we'll have the whole show anyway, with built-in unification." Indeed, with the big carriers in the strategic bombing picture and Polaris submarines now on station, Navy missions currently range from one end of the military spectrum to the other. Yet the Chief of Naval Operations still manages to keep track of everything, from the foot-soldiers in the Marines to ballistic missiles, even though he cannot possibly have had personal experience with them all. Is there any real reason to believe that he, or any of the Joint Chiefs, could not adapt themselves to the responsibilities of an Armed Forces Chief of Staff?

The Symington Committee proposals stop well short of the stated Air Force Association position of one Secretary, one Chief of Staff, one service. But they go a good deal farther than the Navy and its supporters even care to think about. The Democratic Party platform is committed to a "complete reexamination" of defense reorganization. Yet, with a crowded legislative docket, the new Kennedy Administration is likely to avoid any head-on fights on the Hill for statutory support. Of the new Pentagon team, Mr. Gilpatric, the Undersecretary of Defense, served both on the Rockefeller Report Panel and President Kennedy's special committee, headed by Senator Symington. Mr. McNamara has promised Mr. Vinson, long-standing congressional foe of unification, that he will not undertake any sweeping reorganization in the near future.

But a great deal can be accomplished without waiting or fighting for new legislation. The Secretary of Defense has great powers, yet unused, which can accelerate the process immeasurably. Mr. Gates was keenly aware of this and was moving in this direction, as witness his establishment of the Joint Strategic Target Agency as the next best thing to a unified strategic command, and the setting up of a joint long-line communications agency. Mr. Gates's most important single decision was probably the initial one to attend meetings of the Joint Chiefs. By doing so, he placed himself in position to make these significant moves.

Some of these measures that can now be taken unilaterally by the Secretary include such devices as loading the unified commands and the Joint Staff with three- and four-star billets; integrating the component and unified staffs in such places as the Pacific Command; rotating commanders in unified and specified commands without regard to traditional service backgrounds—there are many other examples.

The Secretary who wishes to exert pressure for unification can utilize other powerful allies—if he has an aggressive, imaginative General Counsel; if his Assistant Secretary of Defense, Comptroller, applies the power of the purse; if his Director of Defense Research and Engineering blows the whistle on unrealistic, wasteful, and self-serving development programs.

We have never specified that our unification goals must needs be satisfied with legislation. Our interest is in ends, not means. Imaginative, determined leadership is still the best way to skin a cat.—END

The Air Force Association celebrates its fifteenth anniversary this month. Through a decade and a half of cold war, limited war, and space race, AFA has worked "for the defense and protection of our national heritage as free men." Today, in a world of grim challenge, the job has just begun...

'For National Security and World Peace . . .'

A SPECIAL REPORT

FIFTEEN years ago this month, at the dawn of a new era of human history, the Air Force Association came into being.

Charter Day was February 4, 1946, less than six months after World War II. The new organization had nine members who shared common memories of history's first great air war.

Today, after a decade and a half of cold war, limited war, and space race, AFA numbers more than 55,000 members throughout the nation. It is the best known and most influential organization of its kind in the world, with a long list of accomplishments to its credit.

This is a fifteen-year report on those accomplishments, on where AFA has been, and where it is today. With this report, AIR FORCE/SPACE DIGEST proudly commemorates AFA's fifteenth anniversary.

At the outset, AFA set itself a triple objective:

- To assist in obtaining and maintaining adequate airpower for national security and world peace.
- To keep the AFA members and the public abreast of developments in the field of aviation.
- To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

Energetic efforts to translate these objectives into action began almost at once. The newborn Association played an active role in campaigning for creation of an independent United States Air Force. It led in a nationwide drive for a strong USAF in the defense-economy days before the Korean War. Then, during the war, AFA was among the first to call public attention to brutal Communist treatment of prisoners of war and methods of brainwashing that resulted in false "confessions" of US germ warfare.

After Korea, which had provided fresh proof that the road to war is paved with unpreparedness, AFA stepped up campaigning once again for strength and progress in aerospace development, at the same time running a series of major conferences dealing with problems of the new jet and space ages. In 1957, AFA officially sponsored a yearlong series of observances marking the fiftieth anniversary of US military aviation. Two years later, in 1959, came the first World Congress of Flight at Las Vegas, Nev., a unique and successful attempt to bring together in one place and at one time the hardware of military and civil aerospace activity and the leaders of world aviation.

Through it all, AFA has time and again laid this principle on the line: Only through total unification of the armed forces can the United States attain her full armed potential. AFA has continually supported legislation to this end. The trend toward unification has been unmistakable in the past several years.

This, then, is a quick run-through of the works by which AFA has been known through the past fifteen years. But it touches only the highlights of the Air Force Association story, which actually began in France in 1945.

Let us take a closer look, year by year.

In April of **1945,** Gen. H. H. "Hap" Arnold, World War II Commander in Chief of the Army Air Forces, was on an inspection tour of installations on the European continent. With him was Maj. Gen. Fred Anderson, then up for reassignment to Washington as Deputy Chief of Staff for Personnel. General Arnold talked of his hope for an independent civilian organization to carry on the airpower crusade after hostilities were over. He suggested that General Anderson, after he returned to the States, try to find a man of stature, a veteran of the World War II Air Force, to lead the group.

General Anderson found the man he wanted in Maj. Gen. Edward P. Curtis, who had served as Chief of Staff of our strategic air forces in the ETO and was then awaiting his discharge from active duty. Ted Curtis was also an air veteran of World War I. He shot down six enemy planes in that one. (This same Ted Curtis, it might be noted, now an Eastman Kodak executive, served years later as President Eisenhower's Special Assistant for Aviation Facilities Planning and then as General Chairman of the first World Congress of Flight.) In 1945, as he was being mustered out of the service, Ted Curtis received a letter from "Hap" Arnold requesting him to take on the Air Force Association task. Curtis accepted, and the idea was in motion.

On October 12 of 1945, twelve men met in New

York to do something about setting up the Air Force Association. They came in response to a letter from Ted Curtis, which read in part:

"The present thinking is that this should not be a veterans' organization in the ordinary sense of the word. . . . It is to be strictly an air organization designed to perpetuate the fellowship of former members of the Air Force and to provide a national organization which will help to educate its own members and the public at large in the proper development of airpower. . . ."

The dozen men present were Gen. Carl Spaatz, later the first Chief of Staff of the Air Force; Julian B. Rosenthal; Rufus Rand; Willis Fitch; Everett Cook; J. H. "Jock" Whitney, Ambassador to Britain under President Eisenhower; C. V. "Sonny" Whitney; John S. Allard; Sol Rosenblatt; Col. (now Maj. Gen.) Robert E. L. Eaton; the late W. Deering Howe; and Mr. Curtis.

Four months later, on February 4, **1946,** AFA was incorporated in the District of Columbia as an independent, nonprofit organization. From the outset, civilian control was paramount, fulfilling General "Hap" Arnold's desires. Only civilian members have the right to vote and hold office in AFA.

The nine initial members (no "first" member shows up in the records) were Curtis, Rosenthal, Howe, Rosenblatt, and Allard of the original group, and Jimmy Doolittle, Jimmy Stewart, Lowell Weicker, and Grenville Carroll. By acclamation, Jimmy Doolittle was chosen President of AFA until an election could be held at a National Convention. First headquarters were established in a small basement office on K Street in northwest Washington, D. C.

Then things began to happen fast. An AFA group headed by General Doolittle paid a call on President Truman at the White House, where it received encouraging words. AFA's first Squadron was formed in Baltimore, the first state Wing in Ohio. AIR FORCE Magazine, which had been the official service journal of the Air Force during the war, joined AFA in 1946 and has continued to be the major operation of the Association.

During the first year and a half, in the drive for an autonomous US Air Force, many thousand Army Air Forces veterans organized under the AFA banner. And Jimmy Doolittle was able to tell the first National Convention at Columbus, Ohio, in **1947:**

"No organization did more than the Air Force Association to achieve a coequal and autonomous Air Force."

The major address at this gathering in Columbus was delivered by Gen. Dwight D. Eisenhower, then Army Chief of Staff. He said:

"The creation of the United States Air Force as an independent entity recognizes the special capabilities of airpower; the creation of the Air Force Association recognizes aviation problems that require specialized —and organized—civilian assistance toward their solution. In this group we have a wealth of military and civilian talent that will devote itself to our defense needs, even as it keeps always in view the potential usefulness of the airplane in bringing the world closer together in purpose as well as in time. . . ."

The fight then shifted to a new front. Under its second President, Tom Lanphier, the Association took the lead in a campaign for a seventy-group Air Force. At rallies across the country it called attention to the nation's military weaknesses. From one meeting in Westchester County, N. Y., a telegram with hundreds of signatures went to the White House urging a larger Air Force.

AFA came into national prominence in **1948,** with its second National Convention. This featured a mammoth stage show in Madison Square Garden, N. Y. Participants—headed by Jimmy Stewart and Bob Hope —included scores of public personalities from Bernard Baruch to Gypsy Rose Lee (whose act caused a temporary blackout in a four-hour TV presentation of the event). Garden President John Reid Kilpatrick called it "the greatest show ever put on" at the famed arena. The outcome so far as AFA was concerned was that people all over the United States learned of AFA and its airpower crusade.

Also at the New York Convention, which chose C. R. Smith of American Airlines as its third President, AFA decided to broaden its membership base, admitting as Associate Members men and women who believed in the objectives of AFA regardless of previous military service.

To dramatize the potentialities of the air age, former President Lanphier in **1949** made a well publicized round-the-world flight by scheduled airlines. He completed the global trip in less than 120 hours to set a scheduled airline record for globe-circling. A large envelope, postmarked by nations around the world during the trip, later was presented to the National Air Museum of the Smithsonian Institute in Washington, D. C.

AFA put on a spectacular air show at Chicago in 1949 in conjunction with that year's National Convention. Military planes of many types crammed the Windy City's O'Hare Airport. On hand with her crew was the B-50 *Lucky Lady II* not long after its completion of the first nonstop trip around the world. A C-54 also arrived direct from USAF airlift duty in Soviet-blockaded Berlin.

In Washington, AFA pursued its objective to upgrade the prestige and career status of the military profession. In 1949 President Smith sent a letter to every member of Congress calling for higher pay for all men in uniform—the start of a continuing AFA campaign in behalf of our military manpower.

Then the Air Force Association was threatened by a manpower problem of its own.

It came with new war—a war that caught America fully as unprepared as AFA had long predicted. When the nation responded to Red aggression in Korea thousands of Air Force veterans—many of them AFA members—were recalled to active duty. Some AFA units were decimated. In San Francisco, for example, eighty-five percent of AFA's chapter members were called back. The pinch was on.

Meanwhile, AFA jumped into the tactical controversy (still not resolved in 1960) over air support for ground troops with a special magazine issue on the subject. AFA President Harold Stuart, later Assistant Secretary of the Air Force, toured Korea for on-the-spot reports to members. Then AFA helped introduce

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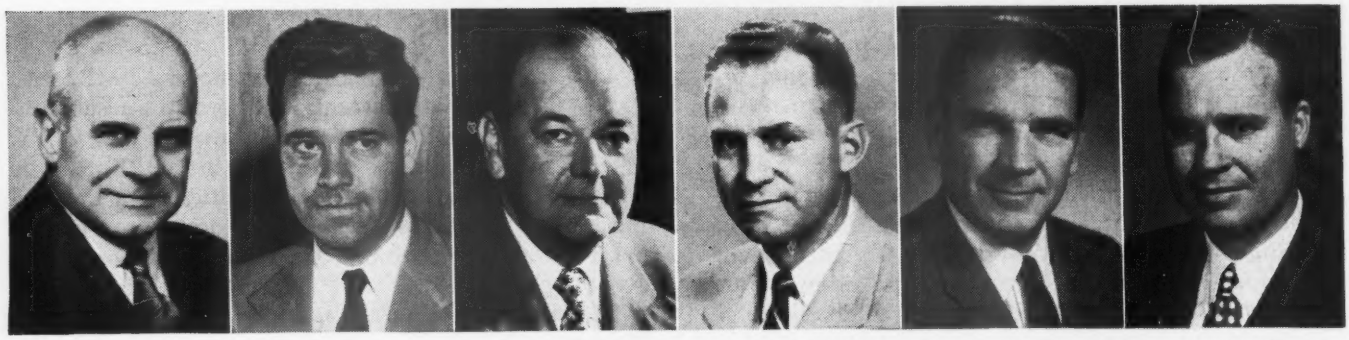
AIR FORCE ASSOCIATION NATIONAL PRESIDENTS—1946-1961



Doolittle 1946-47 | Lanphier 1947-48 | Smith 1948-49 | Johnson 1949-51 | Stuart 1951-52 | Kelly 1952-53

Kenney 1953-54 | Alison 1954-55 | Wilson 1955-56 | Henebry 1956-57 | Schenk 1957-59 | Markey 1959-60

the nation to a new breed of fighting man—the jet combat pilot. The Association held rousing homecoming celebrations for men who held the air fort over the Yalu. The welcoming party for one of the returning jet aces was a nostalgic reminder of earlier days. Col. Francis "Gabby" Gabreski, America's top living ace of all wars, was one of the early leaders of the Air Force Association and its first Wing Commander in California. Another ranking World War II ace, Bob Johnson, served as AFA President for two terms in 1950 and 1951.

The wartime pinch in national air strength was emphasized in **1950** when an air show at AFA's National Convention in Boston had to be held with only one US military plane in the air—that a Marine Corps helicopter. Royal Canadian Air Force jets were the main participants.

So far the Air Force Association had been preoccupied with the need for greater acceptance of the airpower concept—and had carried out the campaign in a fraternal atmosphere. Evidence of far broader objectives came to light in 1950 when AFA initiated the Armed Forces Day Dinner in Washington—a tribute to all members of the defense establishment held annually since that time (under cosponsorship of the Navy League, Military Order of the World Wars, and AFA). AFA also brought together a number of Air ROTC groups in one national honor fraternity, the Arnold Air Society, established Cadet membership in the Association, and launched its now broad educational program.

The Air Force Association further broadened its approach the following year, **1951,** with the initiation of the Industrial Associate program, knitting two major elements in the airpower team closer than ever. Since then industry has played a major role in some of AFA's most important programs. These began with the symposium on industrial preparedness at the Detroit Convention in 1952. They have continued in conferences, seminars, and briefings, at each Convention and between annual meetings at points across the country. These gatherings have dealt with such matters as jet noise, airport expansion, air logistics, manpower, materiel, research and development, and the space challenge.

Thos. Stack, Current AFA President

A spectacular pageant in the Hollywood Bowl, in which Jimmy Stewart, Bob Hope, and many others

took part, celebrated the fifth anniversary in 1951. The pageant covered the history of flight from Kitty Hawk to the present.

All the while, as the bloody battle of Korea continued, AFA campaigned under the leadership of **1952** President Art Kelly to clarify in the public mind the true nature of the Communist threat (those were the days of "agrarian reformers" in China and confusion over Russia's part in the Korean War).

In **1953,** the fiftieth anniversary year of powered flight, AFA stepped in to assist the struggling Kill Devil Hills Society in adequate observance of the first flight of the Wright brothers off Kill Devil Hill near Kitty Hawk on December 17, 1903. (This project, which started with little more than the monument on the sand dunes at the site, climaxed in 1960 with dedication of a tourist center there under auspices of the US Public Park Service, with AFA participating in the dedication.) In 1953, as well, AFA entered into closer relationships with Air National Guard and Air Force Reserve groups, relationships which have grown increasingly closer through the years.

During **1954,** with retired Gen. George C. Kenney at the AFA helm, the Association mounted a determined campaign to seek public understanding of the problems facing prisoners of war in Korea who "confessed" that they took part in US germ warfare against Communist forces there. Without condoning such "confessions," the Association argued that these prisoners were victims of brainwashing and other inhuman treatment that added a new dimension to the prisoner-of-war problem—and indeed to war itself. (Later on, a special Air Force Board convened to study the matter came to substantially the same conclusions as these earlier AFA pronouncements.)

When the Communists persisted in making major propaganda tools of small groups of Air Force prisoners of war, AFA President John R. Alison in **1955** petitioned Congress, the White House, and the United Nations to take action. AFA takes humble pride in the belief that its actions in those grave hours increased public understanding of the prisoner-of-war challenge in Korea and helped counteract that Communist offensive. Significantly, AFA's Presidents in those critical years—Kenney and Alison—were veterans of war in the Far East and ardent students of Communist tactics (General Kenney was America's top air commander in the Pacific; Reserve Maj. Gen. John Alison was a leader of the Air Commandos in Burma during World War II).

With the Korean War past, once again the accent turned to campaigning for America to keep her aerospace guard up. While Air Force global deterrent strength was generally responsible (though not generally understood) for preventing limited war in Korea from expanding into big war, the problem at the conclusion of the Korean conflict was to maintain this deterrent superiority in the face of Russia's crash program to develop its own global striking power. In the long run, the airpower education challenge was as great as ever. To meet the challenge, Gill Robb Wilson, AFA's **1956** President and a noted speaker, took the platform over a route that extended more than 60,000 miles. He traveled, incidentally, on his own time and money. All of AFA's elected officials serve voluntarily, without compensation.

From the New Orleans National Convention in 1956, which commemorated the ten-year anniversary of AFA, went out the message: "The airpower educational job must be done if mankind is to survive our age, and we, the AFA, must be in the lead."

AFA pulled out the stops in **1957** as official sponsor of the fiftieth anniversary of America's military airpower. John P. Henebry, of Chicago, one of the Air Force's most decorated World War II combat commanders and a Korean War leader, was Association President that year. Five decades earlier, on August 1, 1907, the Army Signal Corps had raised the curtain with establishment of an Aeronautical Division. AFA's Golden Anniversary program ran the gamut of events throughout the year.

Air shows and banquets were held in major cities. AIR FORCE Magazine devoted its August 1957 issue to a history of the Air Force, the first complete one-volume history of its kind ever presented. It was later commercially published as a hard-cover book. An Air Force Golden Anniversary postage stamp was issued during AFA's 1957 National Convention and achieved the largest first-day sale in the history of the Post Office Department. AFA conceived, wrote, and produced a documentary motion picture, "Air Force Scrapbook," which received high praise across the country.

Russia marked the year 1957 in her own way. On October 4, she put into orbit history's first artificial satellite, Sputnik. The nation and the western world were momentarily stunned. AFA President Peter Schenk laid the matter at the doorstep of the Administration in an editorial entitled "The Sputnik Pearl Harbor" in the November issue of AIR FORCE. He asked:

"Does the President really believe the nation has a dynamic research and development program equal to the threat, when in fact the program has never in recent years been more sluggish or at a lower ebb? Does he, in fact, see the greatest national problem as one of survival in an age of technological competition? In short, when will the President lead the way so we can again become a nation of explorers and pioneers?"

To the Air Force Association the Russian feat helped prove what the organization had long claimed—that Russia had advanced technologically far beyond official estimates in this country—although the real threat exposed by Sputnik I was swallowed up in Russian propaganda, in the IGY activity, and our own official but naïve "space-for-peaceful-purposes" philosophy. The impact of long-range ballistic missiles on national security was still not generally understood, and the obviously vital military mission in space was unpopular and officially unrecognized.

In March **1958,** AIR FORCE Magazine took up the educational challenge with a pioneering special issue, "The Space Weapons Handbook." It was devoted entirely to the ballistic missile program as a foundation

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for spaceflight, the space mission of the Air Force, and physiological problems involved in getting man into space. This issue was later commercially published as a hard-cover book. In November that year AFA introduced SPACE DIGEST, in effect a magazine within AIR FORCE Magazine, devoted to presenting the best available material from all sources, plus original articles covering the broad subject of space technology and its impact on modern society. (The first hard-cover book of these articles, taken entirely from SPACE DIGEST, will be published later this year.)

Meanwhile, the move into space had spread confusion. The true nature of aerospace power—civilian and military—needed pointing up. With this in mind, AFA undertook the first international event of its kind to be held in the US, a mammoth program integrating the full spectrum of flight—aircraft, missiles, and spacecraft.

This was the first World Congress of Flight held at Las Vegas in April 1959. It was a weeklong air show-exposition-conference run with the cooperation of most of the aerospace family, private and public, in this country and abroad (fifty-one nations were represented). Diplomats, industry executives, military leaders, and top officials of fifty-five aerospace organizations participated against a backdrop of missiles, spaceship models, jet warplanes, giant new transports, and the largest array of aerospace equipment and aerospace components ever assembled.

Life Magazine, which devoted five pages to the event, called it the "world's greatest air-space show." The program reached an estimated 20,000,000 people in an hourlong live telecast over the entire National Broadcasting Company network.

The second World Congress will be held in Las Vegas, September 13-19, 1962.

In the almost two years since the first World Congress, the Association under the presidencies of Peter J. Schenk and Howard T. Markey has held its two largest and most successful National Conventions. Each was built around a report-to-the-nation by the top commanders of the US Air Force. The Titan ICBM was first shown publicly at the 1959 Convention at Miami Beach, Fla. Minuteman, the mobile solid-propellant, second-generation ICBM, was unveiled at San Francisco in **1960.**

While continuing the fight for adequate aerospace power against the mounting Russian challenge, AFA has developed an aerospace education program through its affiliated Space Education Foundation. This is centered in the Aerospace Education Council, composed of leading educators. The council is sponsoring space-age briefings for educators in seven major cities during the first few months of 1961.

AFA today is an organization of many parts and groups—active-duty personnel; Air Reservists and Air Guardsmen; Air Force Academy and AFROTC Cadets; Civil Air Patrol leaders and Cadets; civil and government leaders; educators and community leaders; engineers, scientists, and industrialists. Just as richly varied are the organization's activities: publishing (AIR FORCE/SPACE DIGEST, several aerospace books in print or in progress, the AeroSpace Book Club); meetings, symposia, conferences, Conventions, Aerospace Panoramas, World Congresses of Flight, industrial briefings; the Industrial Associate Program; insurance programs (Flight Pay, Group Life, Travel Accident); Airpower Councils in local communities; national and local aerospace education programs; awards programs to honor accomplishments in many fields of aerospace development.

Most basic, now as at its inception, AFA remains primarily an organization of dedicated volunteers in individual Wings, Squadrons, and Flights, throughout the United States. They conduct active programs of aerospace activities year in and year out at the community level, paralleling the activities of the Association at the national level.

In line with this picture of diversity, the specific issues to which AFA has addressed itself and directs itself at present are legion. A compilation of them would fill volumes.

Over-all, pulling together the many threads of persons and groups, activities and issues that have come to characterize AFA, there is an essential unity built on devotion to the objectives of the world's greatest aerospace organization. This dedication is perhaps best expressed in these words from the Preamble to the Association's National Constitution:

> "We band ourselves together . . .
> for the defense and protection
> of our national heritage as free men."

As AFA completed its first fifteen years, it had moved into an era of "defense and protection" as far more than a function of aerospace power. The free world was locked in a grim across-the-board struggle for survival with international communism. AFA called attention to the nature of the times and of the challenge in its 1960 Statement of Policy:

"Historically, the United States has risen to its full stature only in times of grave emergency.

"Such an emergency exists today.

"We are at war—a war on many fronts.

"On the economic front the war is just beginning.

"On the military front we are still sparring.

"On the ideological and technological fronts we are in all-out conflict.

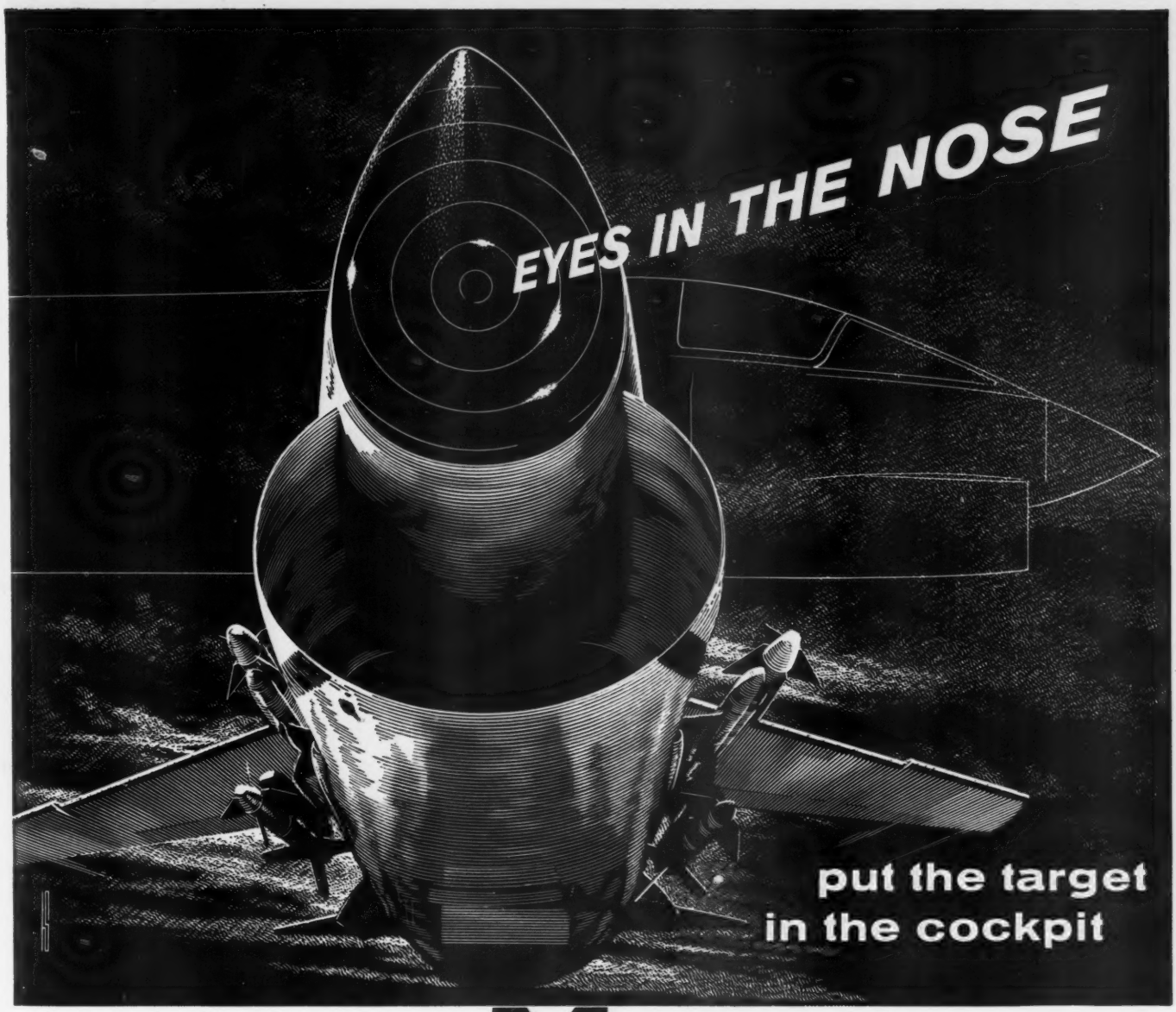
"It still remains for the nation to recognize these facts and rise to meet the challenge to its freedoms."

In the military area, AFA declared, "The military mission in space must be recognized, identified, and exploited with overriding priorities and singleness of direction and purpose. Our deterrent power in the future lies in military space systems. . . . Bold exploitation of the space medium for avowedly military purposes can paradoxically be the shortest road to controlled peace."

So far as AFA's mission is concerned, current President Thos. F. Stack summed it up at the 1960 National Convention in San Francisco, Calif.:

"The job has just started."

—FREDERIC M. PHILIPS



Magnavox

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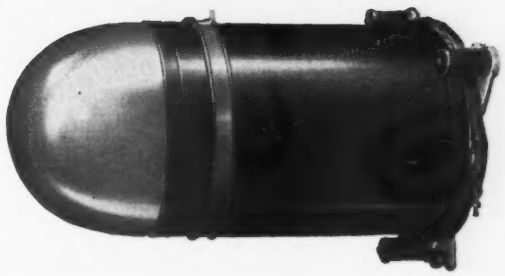
Here are the eyes of a modern weapons system . . . a component that delivers the range, weight and reliability so absolutely necessary to successful tactical operations.

This airborne radar system is just one of many systems which have been and are being designed and produced to satisfy the tactical requirements of the military services in the fields of Communications, Airborne Radar, ASW, Navigation, Fusing and Data Handling.



AIRBORNE FIRE CONTROL RADAR

COMMUNICATIONS	RADAR	DATA HANDLING	ASW	MISSILES

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PROPULSION

— MANY ROADS GO UP

THE TECHNOLOGICAL revolution of the past decade and a half has left its imprint on almost every facet of air and space vehicle development. Nowhere is this more dramatically illustrated than in the vital field of propulsion—key to range, payload, and speed.

Technical progress since World War II has opened up innumerable types of possible engine systems compared to the few that were feasible in the early 1940s.

At that time reciprocating engines were the principal type in development. Turbojets, ramjets, and rocket engines were just emerging from the laboratories of a few persistent pioneers.

Today the Air Force is investigating or developing turbojets, ramjets, liquid-fuel rockets, solid-fuel rockets, nuclear rockets, nuclear ramjets, nuclear turbojets, ion rockets, and plasma rockets. Specific engines within these general classes include: turborockets, turboramjets, external-burning ramjets, turbofans, lift fans for VTOL use, hybrid rockets using liquid and solid propellants, spherical-shaped solid rockets, rockets with plug nozzles, clustered rockets, segmented rockets, direct-cycle nuclear turbojets and ramjets, and indirect-cycle nuclear turbojets and ramjets—among others.

The uses to which these engines can be put are as varied as the engines themselves. Many types of reconnaissance and bombardment vehicles, for use both in space and in the atmosphere, are being studied by the Air Force. Some of these vehicles have recognizable wings, others derive their lift from their body geometry, others are symmetrical and will produce little or no lift. Regardless of their mission the performance of each of these vehicles will depend in high degree on the effectiveness of its propulsion system.

Many improvements in existing engine schemes can be expected, some of them of a radical nature. It is also possible that, in the decade ahead, some fundamentally new means of propulsion will appear.

Development costs are extremely high. The power plant normally is the principal expenditure item for any weapon system, and its development can run to several hundred million dollars. If a major basic- or applied-research program is involved, the total cost of obtaining a satisfactory engine can go to a billion dollars or more.

Management skill is a key factor, perhaps the most important requirement for orderly and efficient propulsion programs of the future. The lead times for new engines are so long, the needs for men, facilities, and dollars are so large, and the technical choices so diverse that there is small room for major error or omission in the space age. The importance of basic decisions and the long lead times required to repair errors of judgment have been illustrated dramatically by the construction of "small" engines for US ICBMs. These engines perform the ICBM task efficiently but do not meet the corollary requirement for large space boosters. As a result, the US space effort faces a severe payload handicap at least until the mid-1960s.

Technological progress in the field of aerospace propulsion presents stirring new vistas and weighty new problems. Upcoming decisions in this vital area will have a considerable effect on the nation's military strength, space capabilities, and budgets in the years ahead . . .

J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE MAGAZINE

PART I — THE AIR-BREATHERS

The extreme payload sensitivity of its booster system is the primary reason for the stretchout in design and development of Project Mercury. The US is limited to a total capsule weight of about one ton for its first man-in-space program; the Soviet Union apparently has a five-ton leeway for the same mission. Undoubtedly, keeping weight down will become a problem with Dyna-Soar. All new types of vehicles seem to gain weight beyond their original estimates.

The magnitude of the management task for all vehicle systems is certain to bring changes in development organization and procedures. This has been the theme of suggestions in every critique of the US research and development effort, from Von Kármán's *Toward New Horizons* of 1944 to the Stever report of 1959.

The three main suggestions are: (1) longer term planning and financing to cover several years or at least the complete life of a development project; (2) increased specialization and technical competence for officers in R&D posts which require major changes in current personnel policies; (3) greater authority and freedom of action for contractors and military personnel on the working level of research and development programs. Under this arrangement highly placed commanders and civil authorities will retain close control only over general policy and the selection of major programs.

Regardless of organizational improvements the main task of top management will remain extremely difficult. It will be impossible to develop and operate all of the technically promising propulsion systems and vehicles. Many feasible systems must be bypassed. The only certainty is that this sorting-out process and the search for the best means of using available resources is certain to grow more difficult with time.

The multitude of possible propulsion systems may be broken down into five general classes to allow a closer look at some of the technical decisions which will have to be made in the near future and during the 1960s.

These decisions will have a considerable effect on the military posture of this country, its ability to explore and control space in the 1970s, and on the national budgets.

The five classes of engines are: air-breathers, rockets, electric systems, propellant-collection systems, and nuclear and advanced systems.

The ultimate potential for air-breathing engines does not yet appear to be in sight in any speed range and for any type of aircraft. Improved designs for lightweight VTOL lifting engines and Mach 3 turbofans are now under development by the military and US engine manufacturers. Air-breathing engines which will operate up to escape speeds of 25,000 mph at altitudes of 250,000 feet or better are now considered possible by competent engine designers, although there is little experimental proof to back up their theoretical predictions. Several types of air-breathing

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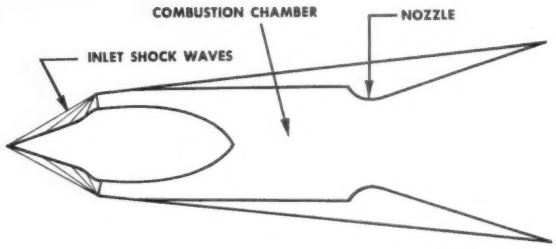
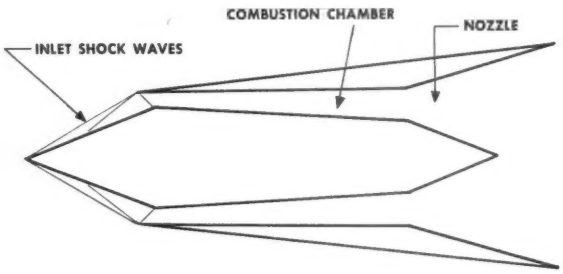
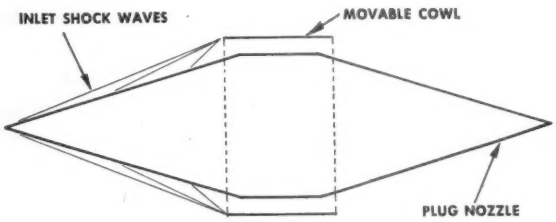


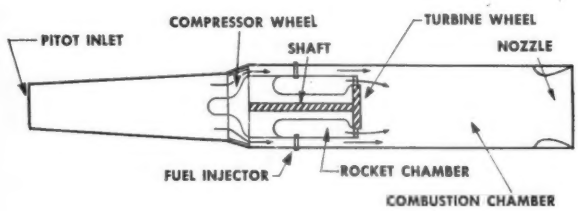
CONVENTIIONAL SUBSONIC COMBUSTION RAMJET



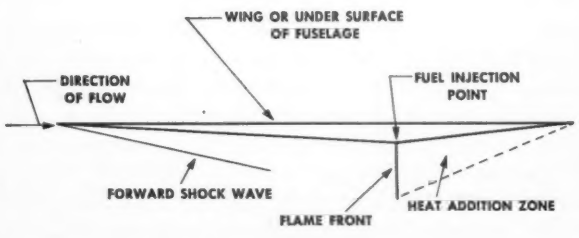
SUPERSONIC COMBUSTION RAMJET



HYPERSONIC COWL-TYPE RAMJET WITH SUPERSONIC COMBUSTION



TURBOROCKET ENGINE



EXTERNAL-BURNING HYPERSONIC RAMJET

engines are considered possible at these extreme speeds and altitudes, including turborockets, supersonic combustion ramjets, and external-burning ramjets *(see accompanying cuts).*

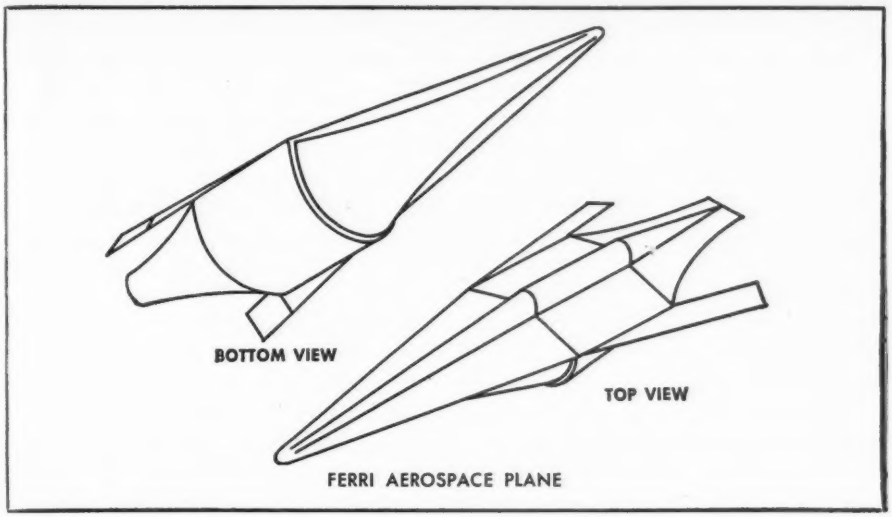
However, the course of air-breathing engine development above Mach 6 or so already has been greatly influenced by management decisions. The National Aeronautics and Space Administration essentially eliminated air-breathing engine research from its program shortly after it was formed around the nucleus of the personnel and facilities of the National Advisory Committee for Aeronautics. The efforts of the group at Lewis Research Center, Cleveland, Ohio, one of the world's largest and most experienced air-breathing engine research teams, was redirected at that time.

This was a controversial decision, both within NASA and among power-plant experts throughout the entire western world. The reasoning behind the decision was that no further basic or applied research was needed by manufacturers to build a new generation of improved turbojets for speeds below Mach 4. This essentially has proved to be true because several manufacturers are working in this area, although much of their effort has been of a research rather than a developmental nature, and NASA data could have been helpful.

In the hypersonic engine area, it was decided that experimental research should be dropped and all effort concentrated on a wide variety of rocket engines, from more or less conventional chemical engines to nuclear and electric rockets. It was believed that the primary requirement in the 1960s would be for rockets.

Now it appears that the military will not follow this policy lead and that perhaps NASA will reverse itself and return to experimental research with hypersonic air-breathing engines. The Air Force is planning to begin applied research leading to a large, one-stage, winged Aerospace Plane that can fly into orbit using air-breathing engines rather than rockets. NASA apparently is going to reenter this propulsion field even if most of the research work has to be done under contract,with Lewis Research Center furnishing the management personnel.

Schematic drawings of five types of air-breathing engines which have potential usefulness at hypersonic speeds are shown at left. The air flow inside the "conventional" ramjet at the top is slowed down to subsonic speeds. This type of engine probably will not be feasible above Mach 6 or 7 because its internal temperatures will be so high that cooling will be impractical with known methods. The air flow in the ramjet second from the top is supersonic in all portions of the engine except the nozzle throat. This results in a cooler-running engine than the "conventional" ramjet. Further research will be required to prove that stable combustion can be maintained in a supersonic airstream. The middle drawing shows a type of ramjet that will operate up to speeds of 18,000 mph, according to the predictions of some US experts. The cowl around the engine would be movable so that the optimum inlet flow conditions could be maintained. The engine would be cooled primarily by radiation from the surfaces behind the cowl. Another radiation-cooled 18,000-mph engine is the external-burning ramjet in the lower sketch. Research has shown that external burning is practical at supersonic speeds, but further work will be necessary to prove the technique above Mach 5. The turborocket, second from the bottom, is one of several types of hybrid, air-breathers which have been experimented with on a small scale.



The hypersonic vehicle at the left was suggested by Antonio Ferri last year. It would be able to accelerate to 18,000 mph and even more and fly into orbit. The entire undersurface of the vehicle is its engine. Both the external-burning ramjet and the ramjet with small cowl (*see opposite page*) would be feasible for this installation. Turbojet engines would be used for takeoff and acceleration to Mach 3. This Aerospace Plane would use a high-energy fuel such as hydrogen.

During the two-year hiatus in NASA's experimental activities small-scale experimental research in hypersonic engine technology has been pursued at the Applied Physics Laboratory of Johns Hopkins University, at the National Bureau of Standards, by several manufacturers—primarily under modest military contracts—and by a few small research firms.

But there is still a great deal of basic propulsion design data which must be gathered before the detailed planning of hypersonic aircraft can proceed on a firm basis. The management decision to gather this data through large-scale basic- and applied-research programs is going to be a big and costly step. There are few facilities in the US at which fairly large-scale engines can be tested at supersonic speeds and none for hypersonic speeds. The supersonic propulsion wind tunnel at the Arnold Engineering Development Center, Tullahoma, Tenn., is the largest, and it will accommodate engines of several thousand pounds' thrust at speeds of Mach 5. This tunnel will be a valuable development tool, but a hypersonic-research program undoubtedly will require as well the extensive use of large flight-test vehicles.

Estimates of the cost of gathering the necessary design data for hypersonic engines are matters for debate. Some figures run to several hundred million dollars for the supporting research alone, with the total cost of developing a single type of operational hypersonic air-breathing engine going to a billion dollars or more. These sums are exclusive of the vehicle development costs and the costs of aerodynamic and structural research.

Other estimates, which come primarily from outside of industry, indicate that the necessary research and development programs can be accomplished less expensively—on the premise that the goals be carefully defined and the program allowed to proceed at its natural pace. Adequate funding would have to be made available from the start rather than sporadically through a review system by outside agencies. Under these conditions the estimates are for a total orbital airplane cost of about $1 billion with half of the expenditure on the power plant.

Regardless of which estimates are correct, it is certain that top-level management in the Administration, the military, and industry will have a great influence on the total cost and ultimate success of any hypersonic orbital airplane.

Technically, almost every problem with the hypersonic engine arises from high temperatures. A number of proposals are being investigated to reduce the operating temperatures of these engines. One of the most important is supersonic combustion (referring to the speed of the airstream in the engine, not to the speed of the vehicle). On convention ramjets of the type now operating on the Bomarc and other supersonic missiles the air entering the engine is slowed to subsonic speeds in the combustion chamber. Burning fuel in a subsonic airstream is much more efficient than burning in a supersonic stream.

However, it is possible to reduce the temperature in the engine inlet and combustion chamber by about one-half (from more than 4,000 degrees F to about 2,000 degrees F in a Mach 8 ramjet) if the airstream is not slowed down to subsonic velocities. Slowing the engine airstream down increases its pressure and temperature and also raises the rate at which its heat is transferred to the engine wall, so that supersonic combustion is a very attractive procedure.

The relative inefficiency of supersonic combustion is overcome at hypersonic speeds by a big improvement in inlet duct efficiency because the engine air need not be slowed and compressed to such a great extent. Temperatures in the supersonic combustion ramjet reach those in a comparable subsonic combustion ramjet at only one point, the nozzle throat. This general lowering of engine air temperature also reduces the tendency of the air to disassociate and soak up energy which might be used to produce thrust. The disassociation loss occurs when the temperature of the air molecules gets high enough to break the molecular bond and split them into individual atoms.

At high supersonic speeds the total effect of supersonic combustion in a properly designed ramjet apparently will be a more efficient and cooler-running engine. At low hypersonic speeds, from about Mach 5 to 10, the supersonic combustion ramjet is not feasible, but the supersonic combustion engine appears to be a workable device. At moderate and high hypersonic speeds (above Mach 10 or 12) the temperatures in the supersonic combustion engine get too high for

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known materials and cooling methods, and a complete change in configuration apparently will be required.

One type of configuration receiving study is the external-burning ramjet which amounts to turning the engine inside out so that its hot surfaces may be cooled by radiation. An external-burning ramjet of typical geometry is shown on page 50. The combustion air is compressed by the bow shock and slowed down to supersonic speed. The fuel is added at the point of maximum thickness, and shape is adjusted so that all of it is burned in the dotted area behind the rearward-facing surface. The static pressure is raised in this region by the fuel combustion, and lift as well as thrust is produced on the slanting surface. For this reason it is more difficult than usual to separate the engine performance from the airframe performance. Through its significant lift production the external-burning ramjet materially improves the lift/drag ratio and the aerodynamic efficiency of a hypersonic aircraft.

Operationally, it has been proposed by Breitieser and Morris of NASA to run the external-burning ramjet "fuel-rich" at the higher flight speeds. There are three main advantages to this procedure: (1) temperatures of the burned gases are lowered because of the excess fuel and there is less disassociation; (2) a varying fuel rate can be used to maintain a match between inlet and exit flow conditions at most speeds so that variable engine geometry will not be required (it is possible that a small movable cowl might be required to maintain efficient operation—*see page 50*); (3) the excess fuel flow can be used to cool the engine and possibly the airframe.

There is one main disadvantage of running the external burning engine "fuel-rich." Its specific impulse is lowered although it remains considerably higher than rocket engine specific impulses. Some researchers say that the specific impulse will remain high enough to ensure a satisfactory acceleration margin to speeds of at least Mach 20 or about orbital speed. Others apparently believe that this type of propulsion could be used to rapidly accelerate an aerospace vehicle to escape velocities as it flies through the upper levels of the atmosphere at altitudes up to fifty miles.

Not all propulsion scientists agree that hypersonic engines will operate as described in the previous paragraphs—or even that these engines are feasible. There is no unanimous agreement that supersonic combustion is possible under all necessary conditions even though it apparently has been achieved in the laboratory over narrow ranges of speeds and pressures.

The first goal of any major research and development program for hypersonic air-breathing engines will be to gather a great deal of basic evidence that there are no substantive holes in any proposed engine system. Once this proof is available it will be possible to sensibly gather engineering design data.

Several other types of hypersonic air-breathing engines are possible and have received some attention. One is the standing wave or detonation ramjet in which the fuel energy is released by passing the fuel-air mixture through a stationary shock wave created by a special shaping of the engine duct. Another is a turboramjet engine (*see page 50*) in which the exhaust products of a rocket engine may be used as fuels in an air combustion process. This double reaction process can be adjusted to achieve an engine performance somewhere close to either the high specific impulse of the turbojet or the high thrust and low weight of the rocket, or to meet a compromise set of performance requirements somewhere in between.

New fuels are an important requirement for hypersonic engines. Petroleum hydrocarbon fuels will not be useful because they are thermally unstable at the temperatures experienced at about Mach 6 and above, and they vaporize and leave deposits on fuel-injection systems, etc.

Hydrocarbon fuels also provide much less range than the high-energy fuels such as the boron-hydrides and hydrogen. The high-energy fuels have higher heats of combustion than hydrocarbons, and they burn efficiently at a lower fuel/air ratio to achieve a given thrust. Therefore, for a given fuel weight they provide more range.

Many fuels have been investigated by the Air Force and other agencies to meet a wide variety of performance requirements. These include such especially tailored fuels as those with small bits of metal suspended in them and others designed to form especially stable combustion products.

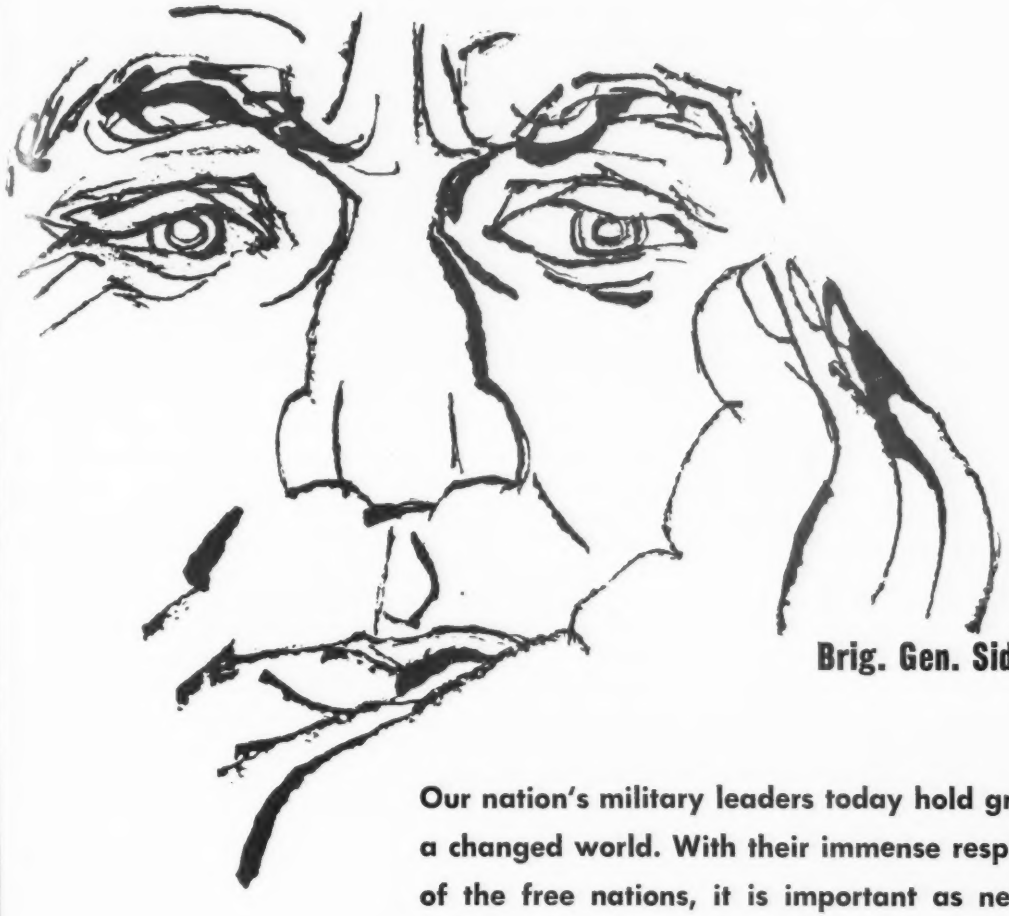
Large facilities were constructed to produce boron-hydride fuels, but their use was canceled because of high costs. Today it seems certain that liquid hydrogen will be the basic hypersonic engine fuel. It is in plentiful supply, and it has the highest energy per pound of any fuel although it is not as attractive as some of the other high-energy fuels from all combustion standpoints.

One of the implications of using hydrogen fuel is that unusually large tank space must be provided because of the low density of liquid hydrogen. One proposed hypersonic aircraft configuration which would have the necessary tank volume is shown on page 51. This aircraft was suggested last year by Antonio Ferri of the Polytechnic Institute of Brooklyn. It is designed to fly into orbit using almost its entire undersurface as an engine after taking off from a normal-sized airfield with turbojet engines. The turbojets would be stopped and their inlets and exhaust nozzles closed at about Mach 3.

Any management decision to pursue a costly development program for hypersonic air-breathing engines will have to be made against a background of continuing improvement in rocket-engine performance. Liquid- and solid-propellant rockets are entering probably their most promising era, and their performance as boosters to "fire" or rapidly accelerate payloads into space or through the atmosphere is improving each year with no sign of abatement.

The nature of these chemical rocket improvements along with a discussion of electric rockets, nuclear engines, and air-liquification engines or propellant-collection systems for use in the upper atmosphere will be presented next month.—END

The American Military Mind in a Strange New World



Brig. Gen. Sidney F. Giffin, USAF (Ret.)

Our nation's military leaders today hold great and terrible powers in a changed world. With their immense responsibilities for the survival of the free nations, it is important as never before that they participate as integral elements in our national life and thought . . .

IS THERE a military mind, and if so, what is its nature in today's complex world?

Of course there is a military mind in the same sense that there is a legal mind or a scientific mind. Possessors of legal or scientific minds, however, are rarely criticized for having acquired the ethics and attributes of their professions. But possession of a military mind is occasionally a matter for reproach.

Or conversely, the lack of a military mind is sometimes the occasion for a left-handed compliment. For example, just before Korea, the Chairman of the Joint Chiefs of Staff, Gen. Omar N. Bradley, publicly expressed alarm at the possibility of inflation should the Louis Johnson defense budget be exceeded. Several leading newspapers applauded the general's position as welcome evidence that he did *not* possess a military mind. And some professional military men might have wondered privately where—if anywhere—the military mind might be allowed to reside if not in the Chairman of the Joint Chiefs of Staff. Incidentally, writing for the *Saturday Evening Post,* General Bradley subsequently acknowledged having been out of character in this matter.

The military mind understands and accepts the professional military ethic. It is the product of study, devotion, and tradition.

Some of the qualities which contribute to the professional military ethic are subject to quick summary. They include a high degree of dedication, obedience, loyalty, integrity, devotion to duty, and the conviction of my country right or wrong. These are conservative virtues, not in any political sense but only in that they seek to preserve. In such a sense, the military mind is accordingly a conservative mind and often a cautious mind, possessing a pessimism with

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regard to human nature which has seldom been disappointed in the short run and never in the long run.

The qualities attached to the military mind are obviously not peculiar to the military, except perhaps that they *all* are attributes of the military mind whereas only *some* may be the attributes of other disciplines. Moreover, not every quality may be regarded as a virtue for segments of society other than the military. An unquestioning obedience to the commands of authority, for example, might elsewhere be regarded as simple serfdom or mere sheepishness. The criteria of others cannot be applied to the military, for obedience is cardinal among military qualities. The military mind deserves to be judged in terms of the requirements of a profession indispensable to society.

In the practice of his profession, a regular American military officer is likely to be as obsessed by it as, for example, medical men are obsessed by their profession. These officers yet remain citizens of the United States and members of its society. In most cases, it is three generations from civilian life to civilian life for the military family. The officer is Protestant or Catholic or Jewish. Because he is conservative in the one sense, he is not necessarily so with respect to issues and questions other than those pertaining to his profession. He may favor public power or private power, or he may favor or oppose rapid integration in the schools. He may reflect sectionalism. Nevertheless, he tends to be apolitical in domestic affairs.

Some measure of apoliticality derives from the nomadic nature of military life. It was traditional in the armed forces of the United States until recently, when with millions in uniform absentee voting became a virtue, to abstain even from balloting. The small officer corps of an earlier day was so deeply imbued with the principle of civilian ascendancy that it voluntarily refrained from exercising such small measure of political influence as might accrue from aiding in the selection of public officials. During recent years, with absentee voting encouraged as a civic duty in the armed forces, the officer corps has made not the slightest attempt to influence opinion in the armed forces respecting political questions or candidates. It will not do so, less because of statutory restraints than because this would be inconsistent with its ethic.

Exception, of course, exists to this rule. *Pro patria,* the professional military ethic, demands support of an adequate military posture. The officer corps is unlikely to consider that any pending posture is as "adequate" as it might be, and this persistent attitude not only encourages lobbying efforts in Washington but may exercise some modest influence on the voting habits of servicemen and women. If this professional bias is taken to suggest that the military mind is not an entirely whole or balanced mind, the indictment has to be accepted. Other professions also exhibit biases.

The institutions of democracy plainly benefit from a professional military ethic which discourages a participating interest in domestic politics. However, it is solely on the domestic scene that the officer corps demonstrates this attitude. Its apoliticality stops at the water's edge, for the military menaces to American national security lie overseas. Our senior military officers must be intimately concerned, if only in their advisory role, with the world powers and politics.

They are concerned with this interplay as it has occurred in history, in its unfolding forms, and as it may, however tentatively, be projected into the future. The view they take is not always a small one. In fact, other than the professional officer corps, no significant segment of American society has consistently throughout our history held what approaches the current "realist" view of world politics.

Until recent decades a realistic American appraisal of power and policy could incorporate considerable optimism, in view of the remarkable good fortune of the geographic position of the United States. With its ocean approaches under British and American control, the country was impregnable at home and might readily bring its military power to bear elsewhere as occasion required. Americans could thus accustom themselves to the idea that their wars would be fought on foreign soil.

The officer corps, sharing convictions which were in fact valid, was enabled to rest strategic concepts and doctrine upon a foundation which appeared proof against frustration. Against any likely enemy, the United States could be held inviolate while victory was contrived. This concept held true through both world wars and the Korean conflict, although the contriving of victory came to involve great cost to and an extensive reliance upon allies.

A similar concept with respect to warfare had previously been able to govern strategic thought in Great Britain. Elsewhere, very different concepts of security had long been thrust upon the military leadership. The communities of Europe, including that of Russia, might plan from time to time on victory in war but could never assure the inviolability of their homelands.

The American officer corps today faces, along with the country, the necessity for change in concepts of security which long have ruled all thinking about the security of the United States. The extraordinary redistribution of power which remains as the accomplishment of two great wars had little to do with the necessity for such change. Science and technology bear the responsibility, in having created a nuclear missile offense which will come fully into being when no active military defense can yet cope with it.

"We are, as a nation, not accustomed to frustrations of history," says the theologian-philosopher Reinhold Niebuhr. Professional military men are not alone among their countrymen in feeling frustration as a result of the new and deeply disturbing security situation. However, the frustration they feel is likely to be more immediate and personal, because its source touches the area which is their professional concern and responsibility.

The military mind cannot but accept General MacArthur's dictum that there is no substitute for victory. Yet the meaning of victory in a total nuclear war would be more in terms of the *survival* of the United States as a self-determining power—and the elimina-

tion of the present principal threat to the integrity of the United States—than in terms of classic military triumph. All efforts to avoid total war, except as the last resort to protect the national honor, should be made, while victory is sought by other means.

The delicacy of this situation raises difficult questions. At what point in limited warfare can defeat be accepted by a belligerent capable of raising the limits? At what point in cold political or limited military conflict might nuclear weapons be employed?

How can the military leadership plan wisely for warfare which might be thrust upon us anywhere at any time, and which might require the employment of forces ranging from the smallest to the largest, with or without the new weapons? Even should nuclear weapons be withheld from use in a theater of war, could forces be disposed other than for nuclear warfare when nuclear weapons await in the wings? Can the technical means of sharing, on a NATO basis, responsibility for the employment of nuclear weapons be so devised as to enhance purpose among the western allies when several among them come to possess nuclear missile capabilities? Is there a means of deterring limited war along with general war? How can we cope with covert and concealed aggression?

There is one thing the military cannot be accused of doing: They are not preparing *solely* to fight the last war.

American military men have persistently sought to deter war without sacrifice of national interest, but never more so than at present. Thus, a ranking Air Force commander says in an interview—"If nuclear war breaks out, SAC has failed in its mission," although he would hasten to add that the Strategic Air Command also has another mission, which is to "win" a war which had not been deterred.

Speaking in Los Angeles some time after Korea, General MacArthur made the statement: "We are told that we must go on indefinitely as at present. Some say fifty years or more. What is the end? None say. There is no definite objective. We must pass on to those who follow us the search for a final solution." Whether any such thing as a final solution may actually exist, it is plain here that a truly great soldier was anguished because he could discern no immediate path leading to a solution compatible with his character.

In truth, the American officer corps shares in full measure "the spiritual problem of modern man, who must find a way of engaging in impossible tasks and not be discouraged when he fails to complete any of them"—as Niebuhr puts it.

It is altogether inconsistent with the professional military ethic that a developing situation of military uncertainty, let alone one of military insecurity, should in any degree be acceptable. The American military mind is compelled to persist in seeking a military solution to the military menace, and if this means a marriage with science our military leaders will be ardent wooers.

In the meantime, until a full military solution is found, the American officer corps has no choice but to hope that a solution which cannot be found in military strategy alone may be available in the grand strategy of the nation, through the admixture of politics and economics with military means. One might anticipate a keen and continuing interest on the part of the military in alliances, bilateral agreements, aid programs, diplomacy, or in any other effort which may give realistic promise of advancing the national security. In response to the challenge of the times, a special sophistication now has to be added to the list of qualities distinguishing the military mind. William W. Kaufmann in his book, *Military Policy and National Security,* suggests how special this must be, in saying . . .

> "The circumstances call for an intensified effort to increase the military officer's insight into the complexity and delicacy of his problems rather than for a redefinition of the military sphere of competence. This is not to suggest that the military officer should become a political, economic, and social expert as well as a military one. It is meant simply to imply that he should be made increasingly aware of the degree and scope of his functions and responsibilities so that he can solicit and make use of whatever advice may be available from these other realms. What patterns of organization and authority may develop from this expansion in orientation and participation need be of less concern than that the expansion itself should take place, and that it should take place without diluting the traditional military virtues."

As never before in time of peace, military forces of the United States have been maintaining, and must maintain, a kind of alertness very close to that which holds for sensitive areas during wartime. The precarious security situation which renders this necessary makes the United States itself an area of sensitivity. A particular military-civilian relationship has to emerge as a result.

No responsible American would wish to see his civilian compatriots undergoing a state of alert which actually approached that of the military alert forces. This could make of the country what has been described as a "garrison state," and might in time come to defeat constitutional purposes.

Nonetheless, the lackadaisical attitude which Americans have thus far adopted with respect to practical measures of civil defense, for example, can only have, in the long run, a demoralizing effect—even a corrupting effect—on their profoundly concerned professional military men. In an armed and hostile environment, until such time as an active military defense promises substantial success in missile warfare, the United States can never again approach invulnerability, but may well be vulnerable in degree as its people adopt or fail to adopt measures of protection.

Very effective measures of protection against any but a direct or close nuclear hit can be taken on a local, and on a family basis. From the military point of view, the failure to adopt such protective measures, as time goes on and the situation remains serious, could only be regarded as frivolous.

Understandably, the American military leadership is likely to accept proposals for the regulation of armaments with something less than enthusiasm. In

(Continued on following page)

this regard, military men stand only in the capacity of technicians offering advice to the political leadership. But the relationship existing in the United States between executive and legislative branches makes it plain that this counsel is likely to weigh heavily.

The obvious vested interest of military professionals in an elaborate structure of armed force provides only a superficial explanation for the military attitude toward disarmament. A truer explanation lies in the skepticism, reinforced by history, with which the military mind views suggestions to renounce force unaccompanied by practical suggestions for eliminating such conflicts of interest as have heretofore yielded only to force. It would be disingenuous to pretend that existing conflicts of this nature would not exist should agreement on disarmament be effected.

Yet the military mind can perceive that armaments themselves constitute at present an extraordinary source of world tension, and that any abatement of tension in a space and missile age might itself lead to other acceptable arrangements. It is thus quite conceivable that honest proposals for measures of real disarmament, accepted by others with the same sincerity as by the United States and subject to reliable mutual checks, would in today's perilous circumstances receive American military endorsement. The military security of the United States is after all the engrossing concern of American military men. If disarmament offered in sober logic the best approach to this end, it is unlikely that any less promising approach could today satisfy the professional military ethic. Some measure is thereby provided of the extent to which unparalleled challenge may evoke unparalleled response in military thinking.

But it is the certain duty of American military leaders to endorse no disarmament proposals in which they can discern dangerous pitfalls for the military security of the United States. There are at least three important areas in which dangerous pitfalls may exist. The first of these obviously derives from the unprecedented complexities inherent in the new systems of armaments which must be controlled if control of any armaments is to have meaning.

These systems surpass in technical difficulties of control, almost as much as in their shattering force, the armaments systems on which agreements were sought at Geneva in the twenties and thirties. No student of past attempts at the regulation of armaments can but recall the endless debates concerning, for example, six-inch *versus* eight-inch guns on naval cruisers. Technical obstacles to the effective control of modern armaments are formidable, indeed, and the military mind should not be regarded as merely captious in being concerned with them.

Again obviously, dangerous pitfalls may exist in respect to the degree of sincerity with which prospective enemies enter upon agreements. Honesty, as the western world understands the word, apparently plays little part in the Communist approach to problems. But the proprietors of a demonic philosophy must be especially subject to self-interest, and the Communist world is at least equally vulnerable with the West to the new weapons. The possibility exists that the Soviet Union, and even the Chinese Communists, may arrive at a willingness to trade advantages on some reasonable basis of equality. Having in mind their objective of symbolically burying the West, they are unlikely to do so without first exhausting every device of advantage to themselves.

Each Communist disarmament proposal has to be examined in this light, and it is the duty of American leaders, whether military or political, to pursue such examinations. Western negotiators cannot permit an eagerness for the approval of uncommitted peoples, or of their own populations, to lead them into accepting disarmament proposals of a specious or meretricious character.

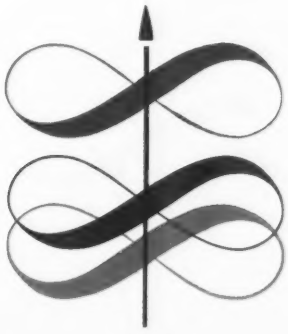
The third pitfall which the control of armaments holds for Americans and other western democratic peoples is one which totalitarians need not fear but which western leaders must somehow fend against. This is the fateful enthusiasm of democracy for "total" solutions, the popular eagerness to see millennia in partial concessions. To the military mind, agreements which place ceilings on armaments may be regarded as delusory unless it is understood that ceilings are also floors, for certainly the opposition will maintain forces no less substantial than agreement allows.

The United States plainly has crossed so consequential a divide in history that at least one cherished concept of the American past has been abandoned almost without debate of the principle involved. This is the concept, rooted in our colonial heritage and reinforced by the prejudice of European immigrants against conscription, that we should rely on citizen soldiers in a war emergency, maintaining in the meanwhile only a minimum standing force. Today, the most critical war emergency we may face demands substantial standing forces in being, and the American people are maintaining with little complaint combat-ready forces tenfold greater than in any previous between-war period.

Despite every safeguard of civilian control, despite every fail-safe device for times of sharp international tension, great and terrible power now resides with the military. American military leaders have specific responsibility for evaluating developments in their military aspects; in order to do so expertly their attention must be confined in large part to acquiring of information and experience quite alien to other echelons of society. It therefore becomes essential that the military profession be maintained as an integral element of the society rather than as something suspected and apart.—END

General Giffin, prior to recent retirement from the Air Force, was Director of the Defense Department's Office of Armed Forces Information and Education, and had served earlier in several high Air Force policy-planning posts. The above article is based on a paper presented to the August 1960 Conference on Science, Philosophy, and Religion in Relation to the Democratic Way of Life, held at the Jewish Theological Seminary of America, in New York.

THE SPACE AGE IN PERSPECTIVE



SPACE DIGEST

VOLUME 4, NUMBER 2 • FEBRUARY 1961

Astronautical Attitudes
By the Brookings Institution 59

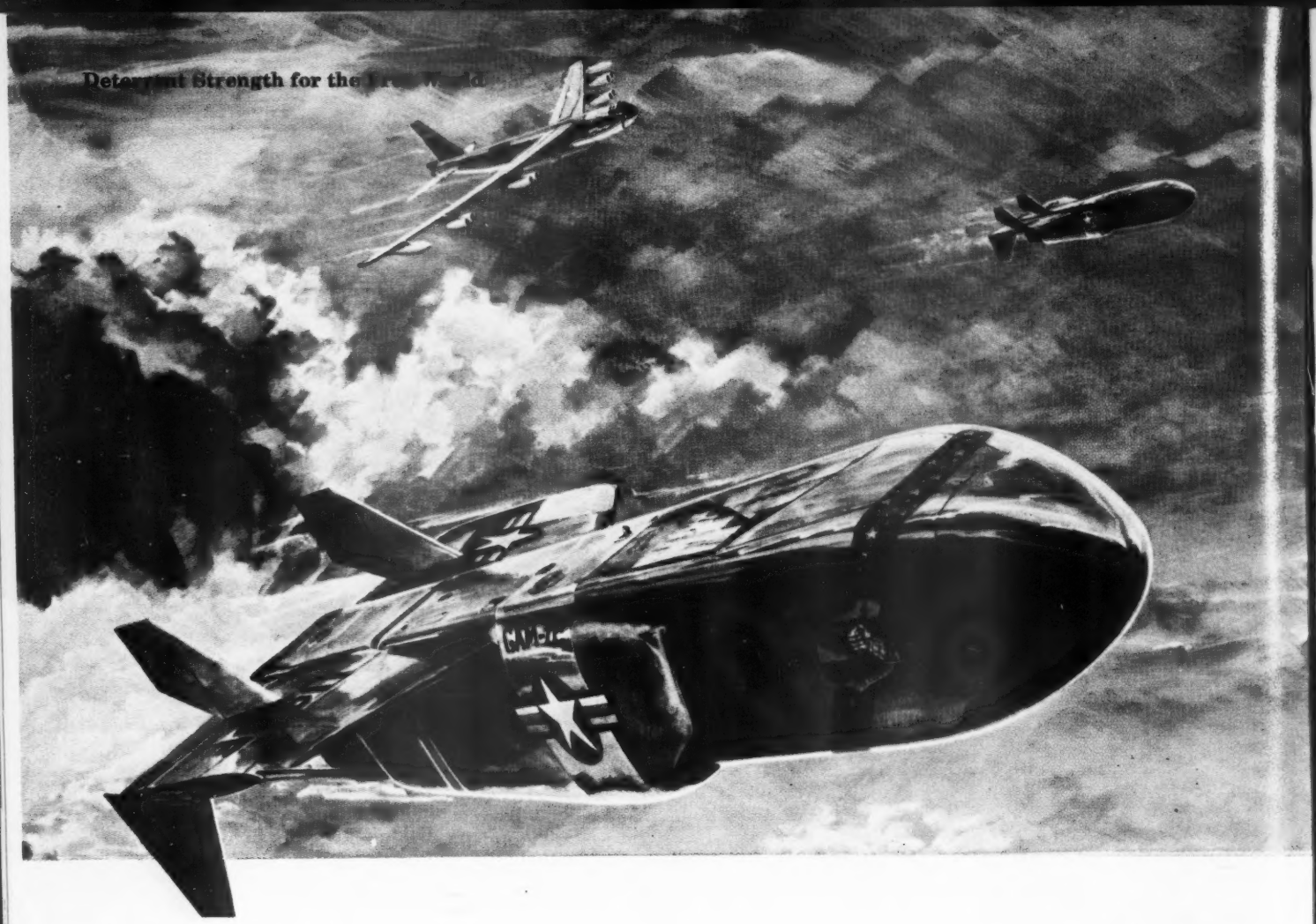
Telescopes or Spacecraft? We Can Afford Both
Robert W. Buchheim 62

In the Space Age, the Crisis Is Man
Archibald MacLeish 65

Letter from Boulder
James G. Allen 71

USAF School for Space Pilots
William Leavitt 80

Speaking of Space
William Leavitt 86



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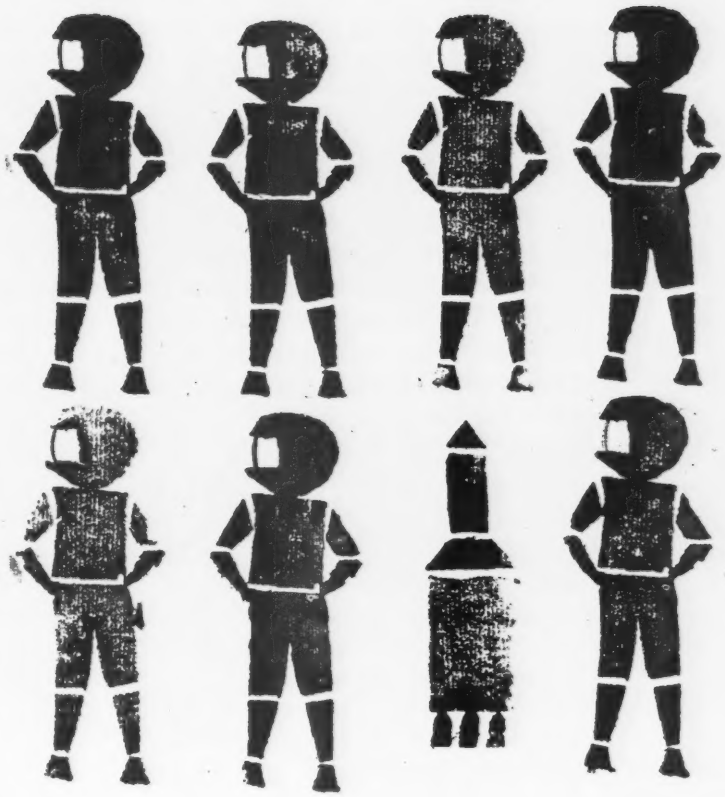
Serious research into "general" and "selected" public attitudes on astronautics is needed if the government is to plan intelligently space programs that will gain public acceptance. Here are some preliminary findings on . . .



ASTRONAUTICAL ATTITUDES

Excerpted from a summary prepared for the Committee on Long-Range Studies, National Aeronautics and Space Administration, by the Brookings Institution, entitled Proposed Studies on the Implications of Peaceful Space Activities for Human Affairs.

SCIENCE and technology and space activities in particular have the potentiality of reinforcing or changing attitudes and values. A democratic government sensitive to the implications of its public's opinions, especially in connection with government-sponsored programs, benefits from exploring and anticipating the impact of its programs on attitudes and values. A major product of space activities has been a variety of stated opinions about the present and future impact of space activities on attitudes and values. Whether or not these statements are valid, they have become common currency and hence can affect public opinion and the interpretation by decision-makers of that opinion. Thereby, research on these supposed implications is warranted.

The impact of space activities on the attitudes and values of the more thoughtful members of the various publics discussed below is evidenced by their concern with problems of national goals and strategies: *i.e.,* in terms of national needs and world responsibilities, what is the proper apportionment of our aspirations, funds, and scarce creative manpower? Space, because of the great claims it is expected to make on all of these, thus becomes central to discussions about social, political, and moral priorities, and research is badly needed to supplement these concerns with knowledge and methods for setting priorities.

Selected Publics

• Many of the scientists and engineers directly associated with space activities are enthusiastic about their work and the uses to which it is being put. Others show varying degrees of disillusion and cynicism, to which a number of factors apparently contribute; it is not known, however, how widespread such attitudes may be. The extent and specific aspects of the situation need study, as do the consequences it may have for space activities and for other activities which can also use these special competences. If the attitudes are widespread and persistent, creative personnel may

leave and the type of personnel attracted to space activities may change. Research would help reveal the implications of such changes for the quality of creative work going into space activities. If the situation is serious, research will be needed on how to produce a more satisfactory relationship between the scientists and engineers of the space community and those who have the responsibility of using their creations for various purposes.

- The attitudes of Astronauts now in training, and their perception of the attitude held toward them and their efforts, may have important implications for their training, their ultimate performance capabilities, and the selection and training of future Astronauts. Research is needed on the relation of attitudes and values to aspirations and fulfillments of performance requirements in this specific situation.

- There is a range of reactions among scientists outside the space community to space activities. Some are delighted with them as tools for other areas of research; others are indifferent or hostile. If scientific space programs are to expand, they must depend partially on the ideas and support of many scientists—including some of those in the latter group. Research is necessary to supply a better understanding of the reasons for and extent of these unsupportive attitudes and their implications for the harmony of the science community, for research in areas other than space, and for space activities. Study is also warranted on means of encouraging participation in space activities by both the natural and social scientists who are favorable to space activities but unfamiliar with the opportunities for making contributions to their own fields through them.

- Given the role of business in politics and economic life, the attitudes and values of business executives as affected by space events may have important consequences for the future direction and intensity of the space effort. Interviews indicate much enthusiasm, especially for the activities in which science plays a major part. However, further research is necessary to determine the tenacity and the depth of enthusiasm and what expectations are held regarding the payoff from space.

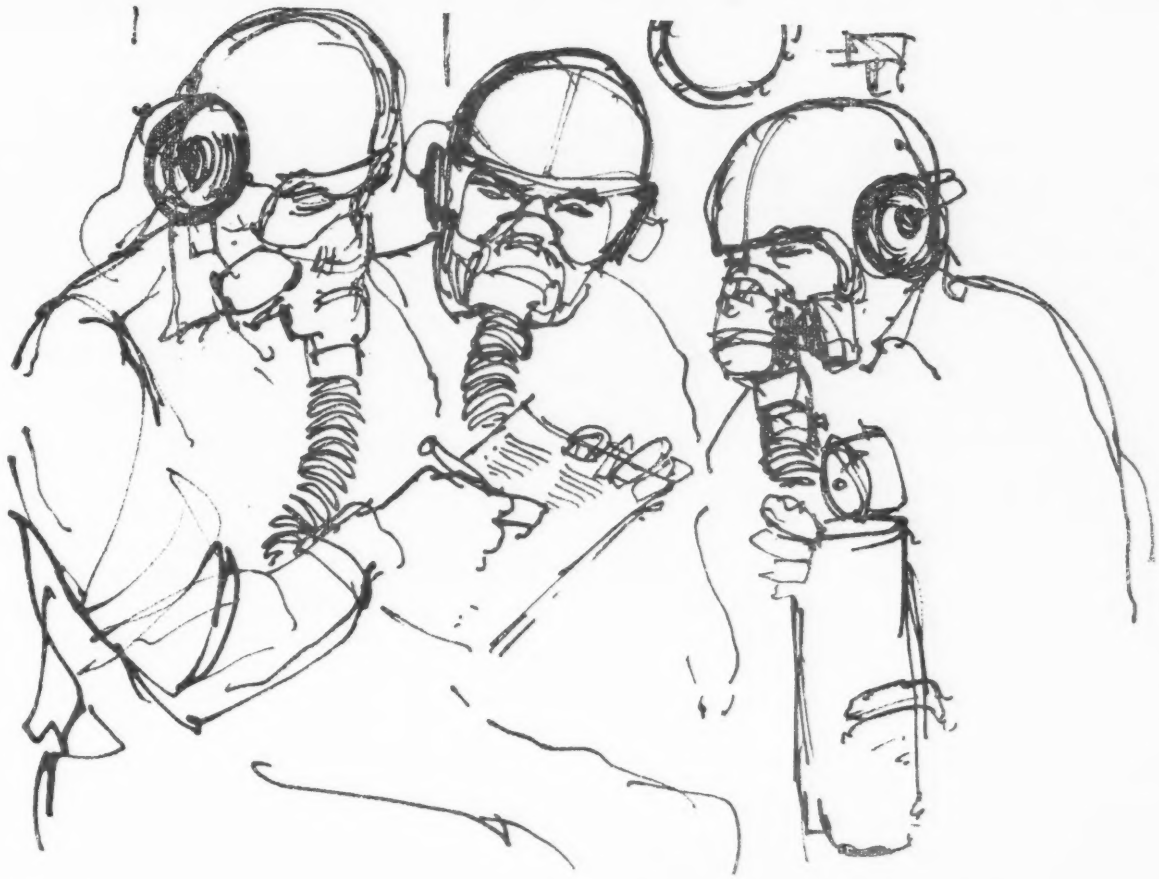
- The impact of space activities on the attitudes and values of today's children is likely to be much stronger than on those of today's adults. Space is "real" to them, since they are not encumbered by a lifetime of attitudes and values that had no need to consider the uses of space. Study of their attitudes and values now, and as they change over time under the further impact of space activities and other events, should help in foreseeing the role of space activities in future years as these children become voters and doers.

The General Public

As with other matters not central to day-to-day living, the public, considered as a whole, is probably only selectively attentive to and knowledgeable about space activities. The relationship between the impact of events on indifferent or only occasionally interested people and their attitudes and values is but partly understood and needs further study.

It has been alleged that the "public" is optimistic about space activities. If this is so and if the optimism is widespread, the present support it generates for the space program may not be lasting if the difficulties inherent in space efforts have not been appreciated enough to make the failure of specific projects understandable. The resulting disillusionment may be a serious factor in reducing public support as space efforts become more grandiose, the consequences of payoff more exciting, and the losses from failure more dramatic. On the other hand, this optimism, if it exists, may produce a state of mind tolerant of failures. The factors affecting optimism, realism, and tolerance of frustration need more study as an aid in preparing for this situation. The roles of the promoter-spokesman and the mass media in encouraging expectations of great and imminent accomplishments are integral to this problem area and would benefit from research.

The conviction that space activities will broaden man's horizons are presently based on the perspectives and special interests of a relatively few people in western societies. The claim may be justified, but there is need for research to assist understanding of the conditions under which innovations broaden or narrow perspectives in various cultures. For example, sufficient emphasis on space as the proper expression of man's highest aspirations may result in the evolution of a broadly based belief that this is so. But whether or not this is likely to be the case cannot now be decided in view of our limited understanding of how new ideas disseminate through societies. If—and as—horizons were broadened as a result of space activities, other aspirations would compete with them for attention and resources, and continuous study would be required to evaluate the appropriate position of space in this competition.



Though intelligent or semiintelligent life conceivably exists elsewhere in our solar system, if intelligent extraterrestrial life is discovered in the next twenty years, it will very probably be by radio-telescope from other solar systems. Evidences of its existence might also be found in artifacts left on the moon or other planets. The consequences for attitudes and values are unpredictable, but would vary profoundly in different cultures and between groups within complex societies; a crucial factor would be the nature of the communication between us and the other beings. Whether or not earth would be inspired to an all-out space effort by such a discovery is moot: Societies sure of their own place in the universe have disintegrated when confronted by a superior society, and others have survived even though changed. Clearly, the better we can come to understand the factors involved in responding to such crises the better prepared we may be.

Man-in-space programs in their early days will confront some groups with value conflicts over the proper circumstances for risking life, family integrity, etc. Arguments are already intense on the merits, or lack of them, of investing heavily in man-in-space efforts. Later efforts may expose Astronauts to living conditions with which many of the public cannot, or will be reluctant to, identify. The threat and isolation of space thus emphasized may repel many people, especially as urban living becomes ever more the life pattern, and support for these efforts, therefore, might be less forthcoming. In some people, however, the adventures of the Astronauts may fire a latent pioneer spirit; support for man-in-space programs might be strong among this group—but it also might be displaced by their newly stirred personal pioneer aspirations. There may be possibly profound effects on attitudes and values if through the Astronaut experiences it is found that the extraordinary abilities sometimes displayed under conditions of extreme physical or emotional stress can be made available to man for use in more normal circumstances.

However, it should be kept in mind that intense solar radiation and heavy-particle cosmic rays may make more than an occasional manned essay into deep space too dangerous to be practical during the time period under examination. If so, the consequences for attitudes and values are not clear. Understanding of the impact of the man-in-space program on attitudes and values in general, and on those toward the program itself in particular, would benefit from a series of studies of public expectations and beliefs as these change over time.—END

"We cannot ask science to justify fully an extensive space exploration program—rather, we must put science in a position to make full use of a program that is going forward anyway."

TELESCOPES or SPACECRAFT?

WE CAN AFFORD BOTH

ROBERT W. BUCHHEIM

ASTRONAUTICS has many aspects of national interest, including military, commercial, and scientific. Each application area involves relating space activities to other ways of doing things, and these relations are important in formulating judgments about space efforts.

Major military space programs are judged on the same basis as are all other weapon programs —they must offer something qualitatively or quantitatively better than other kinds of weapons in order to rate a prominent place in our military spectrum. They must meet the competition of other ways of doing the military jobs.

Those space activities that have a substantial commercial potential will find their way into our industrial complex if they offer something qualitatively or quantitatively better than other devices. Commercial space operations surely must face fierce competition, with heavy emphasis on financial profitability. Our free-enterprise system will see to that.

Space vehicles provide unique means of scientific experimentation, although the resources required raise serious questions about the efficiency of expenditures in this area in relation to expenditures in other forms of scientific research. The issue of competition is also important in weighing various investments for science, in spite of our natural reluctance to place relative value tags on different kinds of research. At present, however, the weighing of astronautical instruments of research against nonastronautical instruments is a very unsatisfying effort because of the utterly incomparable differences of expenditures.

Let me illustrate. It has been estimated that the financial support of all aspects of astronomy totals roughly $10 million per year, whereas it costs about this same amount to launch two small satellites. There is something out of balance here —but the imbalance should not be set right by stopping all satellite launchings; it should be moderated by a more reasonable investment in astronomy. For example, the 200-inch telescope at Mount Palomar, the largest in the world, cost about $7 million. It has been busy and eminently productive since 1950. Why should we have only one? Who could argue with conviction that any single satellite of the kind we've seen to date would compare in value to another Palomar installation?

If more extensive support of scientific research in general is arranged, it is still not certain that the large cost of a vigorous space program ever can be justified fully on the grounds of scientific inquiry alone. In fact, the matter must be looked at the other way around—we must arrange more support for science generally in order to make an active space program really productive of scientific output. Space vehicles can carry only instruments, with or without people to manage them. Space vehicles do not devise theories, they do not

disclose experiments that will illuminate theories with objective fact, they do not ponder experimental data for its theoretical implications—these things are done by men, at desks and in laboratories, alone and in communication with one another.

A space vehicle can be compared, for scientific purposes, with a test tube—and it takes more than test tubes to make up the science of chemistry. We can educate, employ, and equip many more scientists than we now have before the cost of their training, employment, and equipment approaches the cost of our space vehicle "test tubes" and their transportation. We cannot ask science to justify fully an extensive space exploration program—rather, we must put science in a position to make full use of a program that is going forward anyway.

Now, the particular kind of space activity that I wish to argue for might be called large-scale space exploration—the class of activities that prominently includes a general-purpose base on the moon and manned expeditions to the planets. Why should such things be done? They are partly justifiable as scientific ventures; they are partly justifiable because they will surely generate technological by-products; they are partly justifiable because the accompanying scientific and technological advances will have commercial and military relevance. However, such partial justifications look quite incomplete. We cannot forget very real questions like the relative scientific value of Palomar and a satellite, or the relative military value of a base on the moon and a large fraction of the Strategic Air Command. We must look elsewhere for factors that might strengthen a position in favor of undertaking these colossal tasks at a rapid pace. And our looking takes us first to the matter of competition with the Soviet Union, one of the most prominent elements of our national collection of problems.

Astronautical competition with the USSR is, of course, clearly recognized in its specific aspects: They launched the first satellite, they first hit the moon, they first photographed the moon's back side, they first put animals into orbit and recovered them. We were first by a matter of hours in recovering a capsule from orbit. We think we were first in gathering meteorological data from space —although Soviet secrecy, of course, makes this point a bit uncertain. The announced weights of Sputniks IV and V exceed the expected capability of any US launching vehicle short of Saturn—indicating that the US will continue to be in second place in this very basic parameter for a considerable time. Further, there is no comfort in the argument that Soviet astronautical excellence is limited to launch-vehicle size. Their accomplishments to date have clearly demonstrated solid competence all along the line: guidance, reentry, recovery, communications, instrumentation, life-support systems, reliability. The rich variety of their large-scale payloads suggests a well organized team that can carry out with dispatch an integrated program of scientific research, engineering design, and small-lot fabrication.

Competition with Soviet space efforts is tough and getting tougher. If we are to recapture the desirable features of leadership in space exploration, or lower the undesirable features of running second, it appears we must make a much more vigorous attack on large-scale undertakings such as manned expeditions to the moon and planets, in addition to our outstanding efforts in military, commercial, and public service satellite applications.

There is little doubt about the desirability of possessing the fact and appearance of leadership in astronautics; but here again, we must return to the hard question of the worth of something in relation to its price. There is considerable concern about the burdens of deciding upon and adequately supporting the large and costly programs that may be required for leadership. These concerns have to do with the feasibility of carrying on massive space exploration programs on an urgent basis without doing violence to our free-enterprise economy and democratic society, and without squeezing other vital activities such as military defense. These concerns, therefore, involve some deeply important questions that themselves bring out a more fundamental view of the competition between the US and USSR. How does the competition look in terms of these considerations?

To begin with, it seems completely untrue that the United States is intrinsically unable to support a large exploration program—our store of developed natural resources is huge, our vast industrial system is operating far below capacity and its ability to expand is thoroughly demonstrated, our skilled manpower is not being fully utilized. We clearly possess physical and human resources to support a larger space program without real interference with other activities; limits on the things we do are determined more by our own choices than by availability of basic resources. We have the abundance of physical and human

resources that the Soviet Union does not have but yearns to have. If we cannot make vigorous use of these abundant resources, then our way of life may indeed be subject to convincing-sounding challenge from our Communist critics.

Yet the Soviet challenge must be basically hollow, because it is just this free-enterprise democratic system that has put us in possession of these enormous highly developed resources. A determined assault on Soviet space exploration leadership should do much to show that our way can continue to do just what we always knew it could do: provide abundantly for our personal necessities, for the national defense, for extensive leisure time in which to spend $40 billion per year on amusement, for extensive aid to our foreign friends, for a long list of other things far beyond the basic necessities, and, in addition, for a large investment in the adventure of exploring the universe.

Who is watching this competition? The whole world, of course; and much has been said about the effect the space competition has had on the views of neutral populations and governments. However, there are two other groups of great importance—the populations of the US and USSR themselves. The effects on US morale are not to be taken lightly and shattering the Soviet image of space leadership should cause at least some Soviet citizens to be less certain of the superiority of the Soviet system.

Competition with the USSR provides a strong element of external pressure for getting on with large-scale space exploration efforts, such as manned expeditions to the moon and planets. However, this competition should not be our primary motivation. The primary source of challenge should be ourselves. These exploration efforts are great adventures—the kind of thing we should want to do more of as our available resources grow farther beyond a capacity to provide the bare necessities, the kind of thing we should want to do more of if we were free of the burdens of other forms of competition with communism. In short, we should reaffirm the fact that we don't need the Soviet Union as a stimulant to kick us into doing things that are challenging and enjoyable, that our society has the vitality to engage in the adventure of exploration for its own sake, with every expectation that the new discoveries overturned, whatever they may be, will eventually have practical value to science, to technology, to commerce, to defense—and to outdo Soviet efforts while we're at it.

If more of our industrial and human assets are to be set to work on a more vigorous space exploration program without disturbing the basis of our free-enterprise economy, then this greater activity must be paid for just like every other activity. Money must be forthcoming from the citizens and corporations of the United States. Spending this money, through the government, for space exploration should be a form of economic activity not materially different from individual spending for consumption. Private money spent for astronautical goods and services through government channels can generate jobs, salaries, profits, and taxes just like private money spent directly on private consumer goods and services.

There is no incompatibility between a government-managed space exploration program and our free-enterprise system, so long as we retain our faith in that system and use it to carry out a vigorous program.

There is no incompatibility between a government-managed space exploration program and our democratic processes so long as we retain our faith in those processes and use them to establish a vigorous program based on public conviction.

Within our free-enterprise democratic system we have constructed an industrial capacity that exceeds our present utilization and that can be readily enlarged. If we fail to use some of this capacity to overcome the space exploration lead of our struggling competitor, we lend credibility to his claims of a superior economic and political system, and cast doubt on our own vitality. Further, if we fail to use some of our extensive physical capacity for penetration into new activities with a sense of adventure and expectation, then we are depriving ourselves of some of the greatest rewards accruing to our phenomenally successful national institutions, and raising doubts in our own minds about our own vitality.

Our space exploration program can be, and should be, bigger and faster. We can and should have men on the moon before 1970.—END

Robert W. Buchheim is associated with the RAND Corp., where he was a leading contributor to the Space Handbook *produced by RAND for the House Space Committee. A veteran engineer, he is head of RAND's Aero-Astronautics Department. Above article is excerpted from an October, 1960 presentation to the SAE-AFOSR Astronautics Symposium at Los Angeles.*

ARCHIBALD MACLEISH

IN THE SPACE AGE, THE CRISIS IS MAN

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A distinguished poet makes an eloquent appeal for a restoration of human *feeling* to balance the dispassionate observation of the universe which has somehow separated man from the world of nature of which he once so intimately felt himself a part . . .

HUMAN beings have a happy poetic (bad poetic) proclivity for attributing the great squeezes of their lives not to their lives but to symbolic agencies which are seen as the mystic causers and begetters.

Thus it was "the Stock Exchange" which threw us into the great depression, and "the Peculiar Institution" which started the Civil War, and World Communism or the Nuclear Missile which now threatens to destroy the earth.

But the fact is that the Nuclear Missile and World Communism, as well as all the other alleged causes of our present anxiety—the Underdeveloped Areas, the Russians, even that false-Falstaffian figure who now bangs and barks for the Russians—are not causes but consequences: Consequences of human forces which have been acting on the human world for some 400 years now past, and which, in the last forty years or so, have changed not only the character, but to some extent the nature, of our life upon this earth —*and* beyond it.

I refer, of course, to the revolution we once called scientific, and then industrial, and then technological, and now scientific again—the revolution of knowledge which, by changing what we know about the universe, has changed the universe we know.

Our crisis, in other words, like all historical crises, is a crisis in the human situation, not a

crisis in a laboratory or on a launching pad, or even in the office of a chief of state. Human intelligence has made certain discoveries culminating, over the course of forty years, in fantastic acts of mind which have changed everything, including—and this is the most crucial and the most critical of all the changes—the human mind itself. In altering the universe which mirrors us we have altered ourselves as figures in the mirror. And it is this alteration of the universe and of ourselves which has produced the problems which bedevil our time.

Take, for example, the underdeveloped areas—the liberation of the colonies, the rise of nationalism, the great surge of humanity across the continents we once called "dark" or "backward," the new imbalance of power in the world, the new dangers. It was the scientific revolution which taught mankind so to control and modify the conditions of their lives that men need no longer freeze or scorch or die of plague or bloat with hunger—with the result that men who have endured hunger and plague and heat and cold from the beginning of human history now refuse to endure them any longer and will free themselves from misery in one way if they cannot in another.

Or take the Communist conception of the proper form of human society, which half the world has now, willingly or unwillingly, adopted. It was the scientific revolution which discovered how to put an end to Adam's swinking toil by replacing men with machines and so made feasible a social order in which machines come first and men come after—with the result that even the millennial culture of Confucius has been dismantled to make room for the worship of the smelter and the dam.

Or take the bomb. It was the scientific revolution which taught mankind to make a fire as hot as God's—and which, in the process, has put us, as we think and fear, in the place which God once occupied alone.

My point is not that this great shock of change is either bad or good. Like all revolutionary changes—and this may well be the greatest since the invention of agriculture—it is both bad *and* good: terrifyingly bad and unimaginably good. My point is simply that this change is *change* and that the great *effect* of change, like the great cause of change, is in man himself.

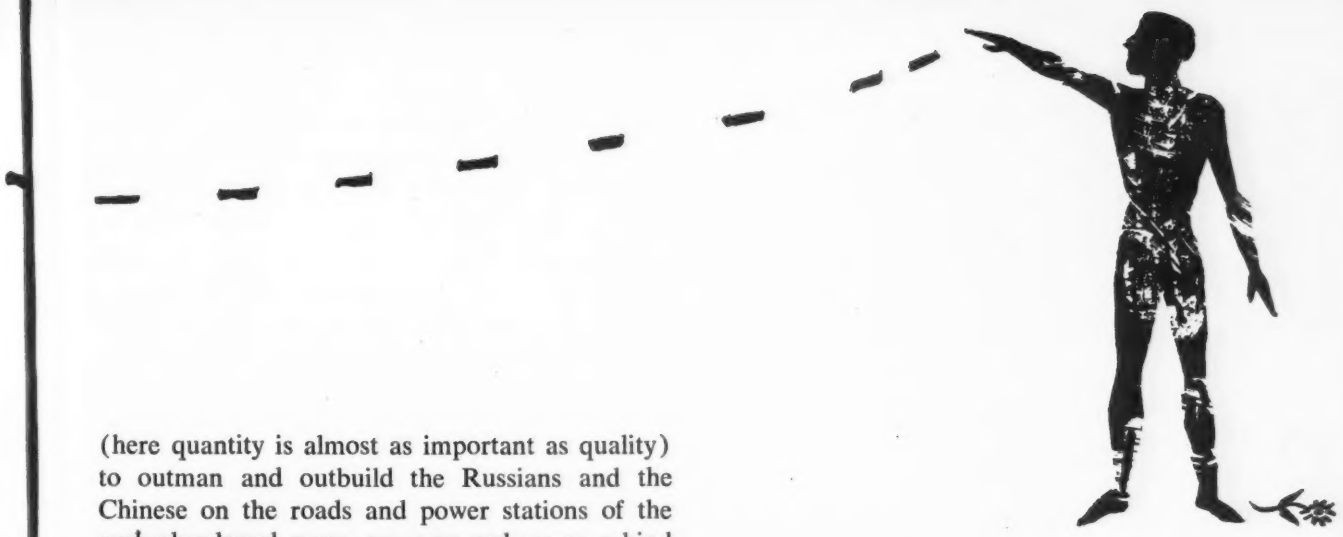
Our crisis is not a weapon or a hostile nation or a political party. Our crisis is man, the new man in whom this new knowledge is carried—along with the old ignorance which was there before: The new scientific man who knows but does not know, who can but can't, who will but won't—and who is dangerous to himself and others because he has lost his relation to his own reality in losing his relation to a world he thought he knew.

We need to remind ourselves of that fact, for unless and until we realize what our crisis is, we cannot very well discuss the measures to be taken to meet it. Slogans as definitions of a problem beget slogans as answers to the problem.

If you say nothing but "bomb" to a university, it will respond with nothing but "more science, more scientists." If you say "Africa," it will reply "technicians." If you utter the portentous word "Russia," you will get a playback of C. P. Snow's argument that the Russians are outproducing us in scientists and engineers by a ratio of five to three, corrected for differences in population, and that all we have to do (if we can do it) is to turn around and outproduce the Russians.

I have no desire to deprecate these simple and forceful answers. They are unquestionably right as far as they go. If our scientists fall behind the Communist scientists in quality—the numbers produced are important only insofar as they affect the qualitative chances—we may very well lose this poker war, in which terror is used to outbid terror, without fighting a battle—if "battle" is the right word for mutual extermination at 5,000 miles.

And if we can't produce enough technicians



(here quantity is almost as important as quality) to outman and outbuild the Russians and the Chinese on the roads and power stations of the underdeveloped areas, we may end up as a kind of underdeveloped area ourselves—a great power suffocating in the vacuum of its own sufficiency.

But these simple answers, right as far as they go, don't go far enough. If it is important not to die, it is important also to live. And to learn to live in the new universe the scientific revolution has discovered for us is at least as difficult as to learn not to die in it: More difficult, perhaps, if one may judge by the kind of living now being done in countries where the scientific revolution has achieved its greatest success. There has probably never been a time when the general disillusionment, in those countries in which men are still free to be disillusioned, was as deep as it is in the brave new world.

And why? Not, I think, because we are, as the moralists keep telling us, "materialistic": which seems to mean, because we are more conscious of our *things* than any generation which ever inhabited the world before. A housewife with a wood-burning stove can be far more conscious of her possessions than our wives and daughters ever have to be with a push-button range which times its own roast and announces dinner with the trilling of a bell.

No, our disillusionment is something more serious than a surfeit of television sets and oversized cars. What troubles us is the brave new world itself—or, more precisely, the new knowledge which has created that brave new world. We know more about the planet and the galaxy and the universe in which it drifts—about the substance of the earth and the uses of that substance—than men ever knew before. But who *we* are in this vast outward-bound of stars and constellations we do not know—or have forgotten.

The old relationship between man and world—a relationship once heavy with myth and intimate with meaning—has been replaced by our new, precise, objective, dispassionate *observation* of the world. With the result that our understanding of our experience of the world has been curiously mutilated. The world is still there—more there now than ever—bright and sharp and analyzed and explicable. But we ourselves, facing the world, are *not* there.

Our knowledge, that is to say, seems to exist of itself independently of us, or indeed of any knower—scientific knowledge stated in its universal scientific laws, its formulas and equations true for all men everywhere and always, not for a single man alone. But, at the same time and for the same reasons, the human savor, the personal significance, the subjective apprehension of our knowledge fades and blurs.

One way to speak of this—a way which some of my scientific colleagues at Harvard, oddly, I think, resent—is to say that the *knowledge* of the fact has somehow or other come loose from the *feel* of the fact, and that it is now possible, for the first time in human history, to know as a mind what you cannot comprehend as a man. I agree that this way of talking is not entirely scientific, and may, perhaps, not even be intelligible, but what I think of when I use these words is only too intelligible.

This divorce between the knowledge of the fact and the feel of the fact exists in our world whether we like its existence or not and it is because it exists that the word Art—or, better, the word Poetry, which signifies for me that way of looking at the world fundamental to the creation of all art—belongs beside the word Science, in these grave discussions. Not until mankind is again able to *see feelingly,* as blind Gloucester says to Lear upon the heath, will the crucial flaw at the heart of our civilization be healed. And to see feelingly only poetry can teach us.

That statement, I have no doubt whatever, will sound, to many, like the worst kind of special pleading. What has poetry to do—really to do—with a world in conflagration, societies in collapse?

Poetry, you will say if you belong to my college generation, is a heading—and a subheading at that—under the rubric, Literature, in the list of college courses. It is an embellishment, something taught to prevent a college's graduates from making unnecessary fools of themselves in their dinner conversations after the day's real work is done—the stock sold at a profit or a loss, the advertisement placed, the lawsuit argued, the draft of the state paper initialed.

Or poetry, you will say, if you belong, not to my college generation but to a generation younger, has nothing to do, can have nothing to do, should have nothing to do, with societies and civilizations and, above all, world in crisis. Poetry is its own world. Poetry never makes anything happen. Life is one thing: poetry another. And you will end up, like as not, quoting those familiar sentences of Thomas Mann:

"Contemner though she is of the base, [art] has never been able to halt the march of evil. Intent on endowing life with reason and dignity, she has never been able to put a stop to the most arrant nonsense. She is not a force, she is only a comfort."

But whichever way you say it, you will be saying the same thing: that poetry is about as remote from the urgent concerns of our generation as anything could well be.

The fact, however, is otherwise. The fact is that nothing is as close as poetry, as the poet's vision, to the tragic dilemma in which we live. If it is true, as it assuredly is true, that our dilemma is founded in those great events which have changed the human situation on this earth, and if it is true that the cleavage of the dilemma is that divorce of the feel of the fact from the knowledge of the fact which frustrates us in our efforts to know ourselves in the new world we live in, then only the poet's vision can right the world for us and right ourselves as actors in the world.

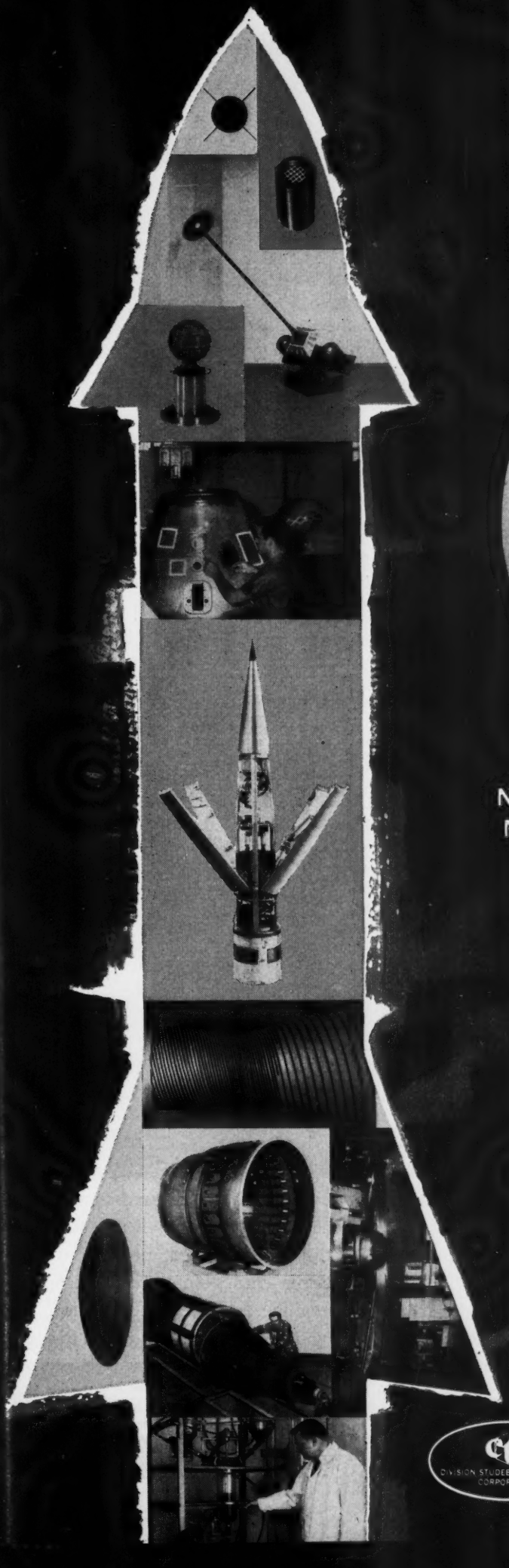
The end and aim of any true work of art is precisely the achievement of the relationship we have lost—the relationships between man and world—between man and man's experience of the world. And the means of poetry, the means by which life is apprehended as something to be felt and experienced rather than manipulated, are precisely the means which, with us, have atrophied—the means by which men *recognize* their lives and so themselves.

Rightly read, any poem is a creation of common experience the effect and action of which is an uncommon understanding of that experience. Rightly perceived, the power of poetry is the power to make the truth "come true"—to give it the form which will endow it with the meaning which will *make* it true, and true not only for our minds but for ourselves as men.

It is for this reason that science and yet more science is not the only answer we must give as we measure our needs in the context of persisting crisis.

The great ages have been ages founded upon one image or another of man against the sky, man against the universe, and that image, whether in Athens or Florence or Loyang or among the rocks Isaiah knew, has always been an image poetry created. Only when poetry reclaims, in the consciousness of living men, the place it had always held in earlier civilizations, will the triumphs of modern science promise us a world in which humanity can live alive.—END

Archibald MacLeish, poet and playwright, is a former Librarian of Congress. Now a professor at Harvard University, he wrote the widely acclaimed play, "J. B.," which received the Pulitzer Prize for drama in 1958. An eloquent exponent of the role of the humanities in the increasing mechanization of society, Professor MacLeish has a new work, "Poetry and Experience," forthcoming. Above is excerpted, with permission, from the December 25, 1960, New York Times *Magazine.*



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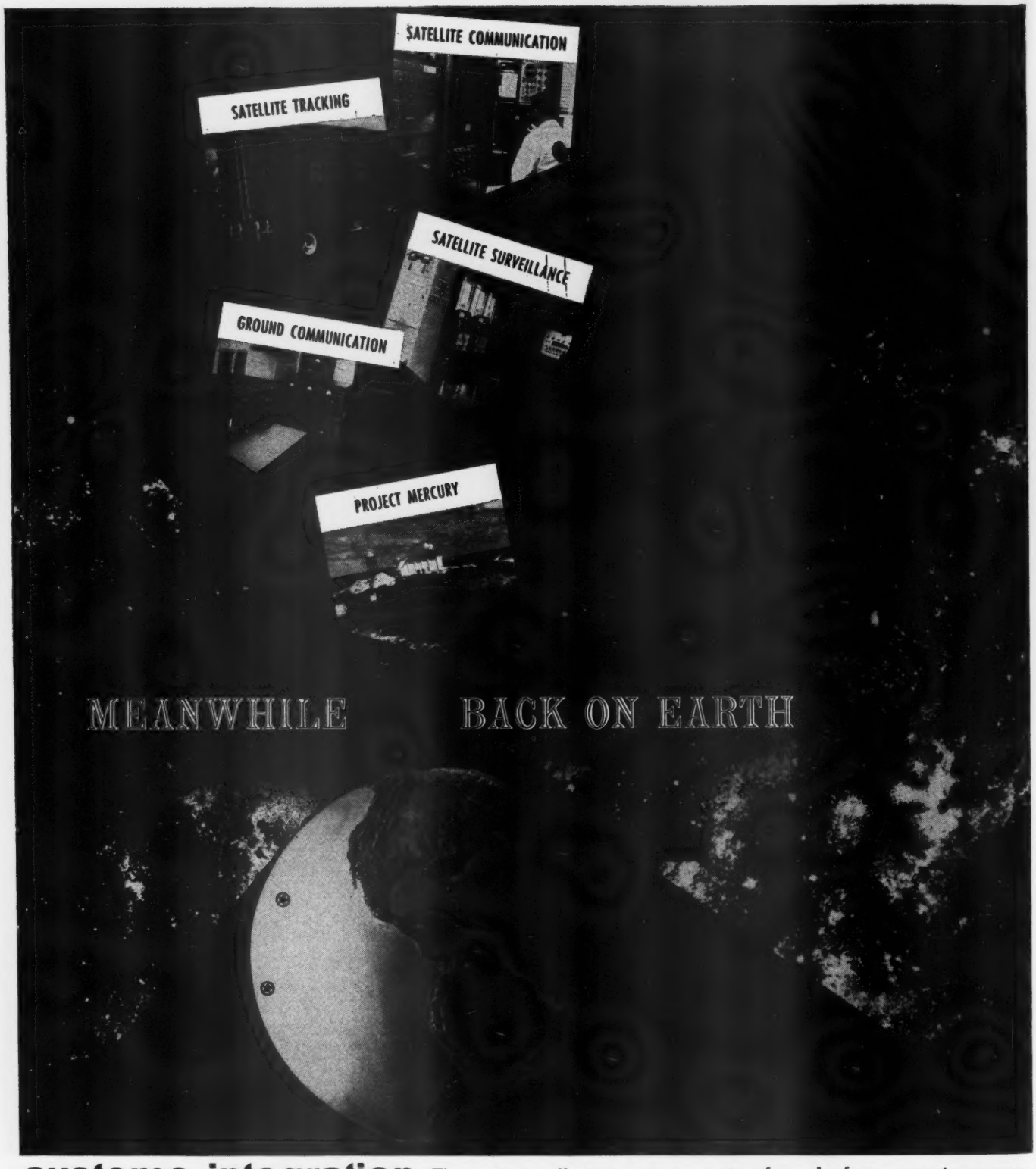

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Against a dramatic Rocky Mountain backdrop, University of Colorado nestles in the valley at Boulder.

Students at the University of Colorado are getting a needed perspective on the space age through a unique history course described in this . . .

Letter from Boulder

JAMES G. ALLEN

A pioneering educational experiment, a course in the history of space, believed to be the first such campus offering in US educational history, has successfully completed its pilot phase at the University of Colorado, at Boulder, under the direction of Dr. James G. Allen, Chairman of the University's Department of History. AIR FORCE/SPACE DIGEST *is especially proud to publish this report by Dr. Allen on the course. He graciously credits his attendance, at the Aerospace Education Workshop, during the first World Congress of Flight of the Air Force Association in 1959 at Las Vegas, Nev., with sparking his efforts in establishing the course at the University.*—THE EDITORS

BOULDER, COLO.

HERE AT the History Department of the University of Colorado, we inaugurated a course in the history of space during the 1960 summer session. Our experiment was well received, with a respectable student enrollment, and, gratifyingly, we received generous coverage in such newspapers as the New York *Times* and the *Christian Science Monitor* among others.

The course was given primarily in terms of the history of cosmological ideas and brought space thought from early times right up to the present. Introductory lectures indicated how primitive man

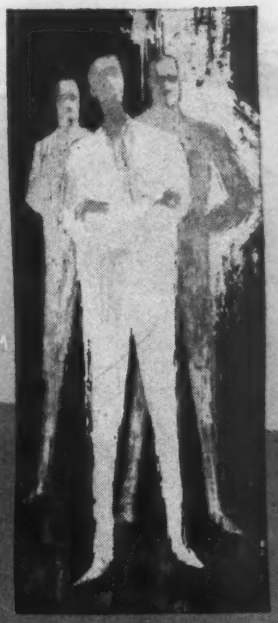
at the very beginnings of civilization speculated on the nature of space and included it in his general picture of himself and his place in the universe. As conclusions began to form, man's concepts of space became closely related to other elements of scientific observation. Ideas of celestial mechanics were basic in the scientific revolution of the seventeenth century. Historical attitudes toward space aided the development of many branches of science. Moreover, man's ideas on space were closely related to the general cultural atmosphere of particular periods. All aided the advance from mythical cosmology to the Newtonian concept leading to the modern realistic and mechanistic view of the universe. The course concluded with a survey of present-day concepts, techniques, and practical values of space exploration.

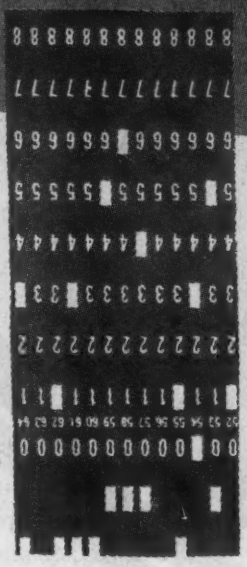
To present the course, the History Department brought two outstanding authorities to Boulder. They were Dr. Melvin Kranzberg, of the Department of History, Case Institute of Technology, Cleveland, Ohio; and Dr. J. Allen Hynek, formerly Associate Director of the Smithsonian Geophysical Observatory, Cambridge, Mass., and now Chairman, Department of Astronomy, Northwestern University. Dr. Kranzberg gave the historical background while Dr. Hynek covered the present-day aspects of space. There were forty-three students enrolled in the first term and sixty-five in the second.

Students were asked to make written, unsigned comments at the end of the summer session. These were helpful in our future planning and included many requests that the course be extended in length to at least one semester. Here are some of the student comments.

- "I think this course was very useful to me. Previously, I have taken some work in history and philosophy and I have done some reading in the field of astronomy. But my knowledge was rather unorganized. Now, having come to the end of the course, I think it gave me a perspective about man's ideas about space. The historical approach that you took was easy to follow and sensible."
- "I took this course to assist me in developing a background for science instruction in the elementary school field. I found the course interesting and enlightening."
- "For a person who has scant background in science and philosophy, this course is most interesting. In fact, this course should be required for any person attending the School of Arts and Sciences."
- "As an aeronautical engineering student interested in space, I found the course enlightening and interesting."
- "This is probably one of the most unusual but yet interesting courses I have ever taken. Since I took both [terms] this summer, I have received a general over-all view of space concepts, modern and ancient. It is practical since we are now living in an age when space is playing a leading role, and one can follow newspaper articles with some knowledge . . . as to what is happening and what are the basic mechanical elements underlying these developments. I found it a most interesting course."
- "With more time, much more could be covered. I think that there are more concepts of science which influenced ideas of space than we had a chance to cover."
- "This course served my purpose for a brief history of space. I think that it is tremendously worthwhile, for in the twentieth century we need people who are, at least, a bit informed. . . . I do think that it deserves more than five weeks as it is too short a time to get much insight into the subject. As a semester course the detail it deserves would be achieved."

when men must make large-scale decisions





The military decisions of today are frequently of a scale new to man. They are based on vast amounts of information gathered from huge spatial and geographic areas. They may involve world-wide forces. And they must be made quickly in response to events of the moment. ■ When men must make decisions on that scale, they use a new information technology—systems designed to help men make decisions and exert control. ■ Sage is such a system. The SAC Control System, which is in development, is another. We are a major contributor to both, and we are beginning work on several new contracts for extremely large systems. ■ Our efforts consist primarily of the analysis and synthesis of these systems, training men for their use, instructing great computers on which the systems are based—and research into future generations of these systems. ■ We have developed a close interdisciplinary approach to system development. Operations Research, Engineering, Human Factors and Computer Programming are the essential disciplines. Scientists and engineers of these persuasions are invited to write concerning new positions in our expanding activities at Santa Monica, California and Paramus, New Jersey.

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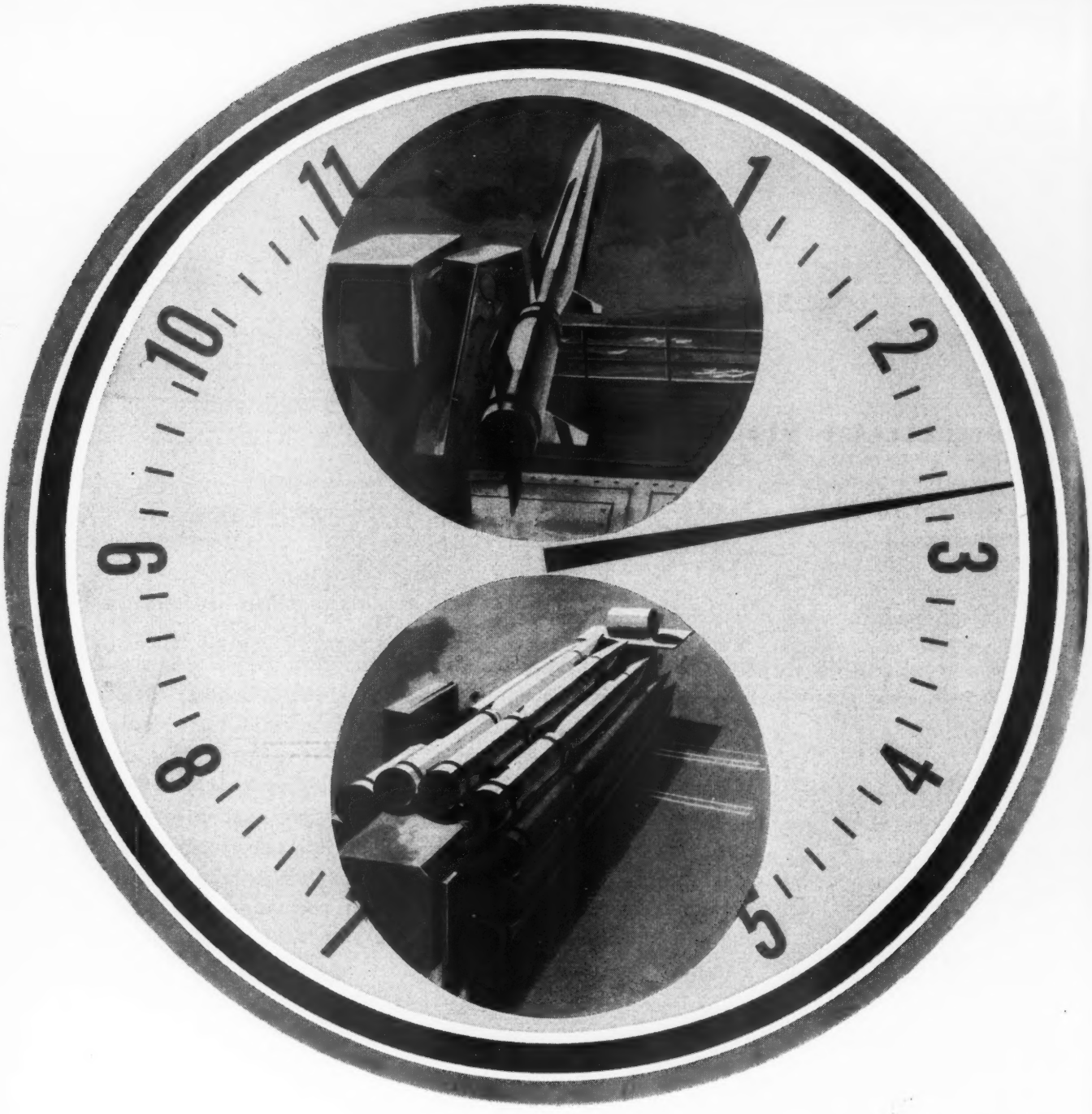

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High Altitude Observatory at the University of Colorado, and soon to join forces with newly created National Center for Atmospheric Research, offers unique collateral study for space students.

• "Being an engineering student, some of the early history of space did not seem too interesting. Galileo to the present seemed to be the best. When I registered for the course I had perhaps the science viewpoint, in that I thought the content would be more along the lines of the history of the 'space' or cosmos itself instead of the viewpoints of historical characters concerning the concept of space."

• "I took this course because I have been exposed to certain of the practical uses of celestial bodies [study of tides, weather, and celestial navigation]. However, I knew little about space or the speculations about it. Since space is becoming more and more important, I thought it might be valuable to gain some knowledge in this area. I was required to have some history this summer, and the title of this course 'caught my eye.' I enjoyed the course and believe that I have profited from what I learned."

We had some difficulty with textbooks, since the course, certainly in a History Department, was new and unrecognized. The first part was based on *Theories of the Universe, from Babylonian Myth to Modern Science,* Milton K. Munitz, editor (Glencoe, Ill., 1957). This, however, was not entirely applicable, especially for a five-week term. Hynek relied principally upon articles, short descriptive pamphlets, and mimeographed material on current developments. Of particular value was the April 1960 number of AIR FORCE/SPACE DIGEST ("Missile and Space Almanac").

The success of this project was gratifying. The course will be given again in the 1961 summer session, and arrangements are being concluded to make it a permanent offering of the History Department. This is a logical step, as such a course provides a broad historical basis for the program of the High Altitude Observatory at the University of Colorado.

The Observatory, under the direction of Walter Orr Roberts, is widely known in its own right. It is also in the process of joining forces with the newly created National Center for Atmospheric Research, now establishing its headquarters at Boulder. The National Center will become a major laboratory devoted to research on the fundamental problems of the science of meteorology and of the upper atmosphere.

Why a Space-History Course?

The exploration of space has become one of the most significant factors of the modern world. Its various aspects are major items in our national economy and dominate certain aspects of our foreign policy. Space, with its many challenges, problems, and opportunities becomes increasingly related to our daily life and to our national security.

There are sound reasons for a university to offer a history of space. Many of the ancient and medieval historians, philosophers, theologians, and scientists wrote about space, even though their observations were to a great degree speculative. Astronomical facts were uncertain and all relationships within the physical realm of the earth, the sea, and the sky, were based upon certain assumptions. However, these early scholars did make significant contributions. For example, some of the conclusions of Aristotle (384-322 B. C.) may be regarded as an inspiration to Columbus and the scientific theory he set forth to prove in 1492.

We know this because, among the many books he read was the *Imago Mundi* of Cardinal d'Ailly published in 1410. In this volume Columbus had marked the quotation, "Aristotle says that the sea is little between the farthest bound of Spain from the East and the nearest of India from the West." Columbus' own copy has been preserved with his marginal note. The accumulation of reliable facts proceeded slowly, surrounded and limited as they were by the sense of mysticism that dominated the early Middle Ages, finally broke through to the great age of discovery that opened in the fifteenth century, and which was punctuated by the astronomical advances of men like Galileo and Copernicus.

Today, the space era is modifying our concepts, with startling rapidity, and with day-to-day change even of essential things, even of time. We know time as it is on earth, affected and modified by terrestial forces such as gravity. Time in space, freed from such factors, may well have an entirely different concept and relationship. Einstein's General Theory of Relativity indicates such modifications, and modern speculations, based upon the rapidly expanding knowledge of space, lead to the staggering conclusion that time itself may shrink as speeds approach the velocity of light. This is only one startling example of how the space age will change existing concepts.

These accomplishments in the discovery and exploration of the African coastline were great marvels of their day, even though they received none of the headlines and little of the fanfare accorded related explorations into space of our time. Our explorations of the heavens are indeed comparable to the advances of the great age of discovery. They, too, have advanced by gradual stages; the early ascent of balloons, the continual increase in the ceiling of our airplanes, the hurling of our satellites, rockets, space capsules, and our shots at the moon and the sun.

It is not fantastic to compare these few early navigators to the now so well known geographical landmarks of Africa and of the other continents with those Astronauts of our day who will make the first American manned flight of rockets into space. It does not stretch the imagination to compare those fifteenth-century barriers inhibiting ocean exploration to belts of radiation, zones of disintegration, areas of planetary dust and atomic particles that today are the obstacles to conquer before space travel comes out of the realms of imaginative fiction and into the fact of the twentieth century. Such areas and zones are constantly being discovered or reexamined. These are examples of the modern hurdles requiring solution, not in terms of overcoming superstition, but in terms of an advanced technology. Our assaults on space have proceeded rapidly and within a short time.

Centuries have elapsed since Lucian of Samosata wrote in A.D. 160 of a voyage to the moon in a sailing ship. But it is less than 100 years since Jules Verne added the idea of escape velocity in his *From the Earth to the Moon* in 1869 and Edward Everett Hale first wrote of the artificial satellite in 1870. It is proper to compare Prince Henry of Portugal with those who, many more in number, now direct modern exploration into space.

All of these historic challenges, of superstition, fiction, and of fact, have been met, and we are now on the verge of an exploration of space comparable to those marvelous events and discoveries of the fifteenth century. It is upon these parallels that a history of space can be based.

With new ideas affecting us, enforcing such great changes in the very fundamentals of our thought, a history of space and an examination of its historical relationships becomes necessary. Such a course is not a fantastic addition to a time-honored curriculum. It is indeed a vital subject for modern education, because it is a great and interesting world in which we live.

No longer will one wish to have lived with Prince Henry and his navigators or to have taken part in the adventures of Elizabethan England and joined with the great captains of that day in exploring the oceans and the land and rivers beyond previously narrow confines. Quite truly are we doing the same things, engaging in the same adventures, and enjoying the thrill of the unknown and the unexplored. Their oceans are our skies and their ships are our rockets and space vehicles. Their problems are our problems. Their dangers are ours. Their accomplishments and successes will be ours also.—END

James G. Allen has been Chairman, Department of History, at the University of Colorado since 1945. He has written frequently in professional journals, especially in the field of British constitutional history, is also author of Naval History and Strategy—A Syllabus and Guide to Reading, *and a recent study, entitled* Editorial Opinion in the British Commonwealth.

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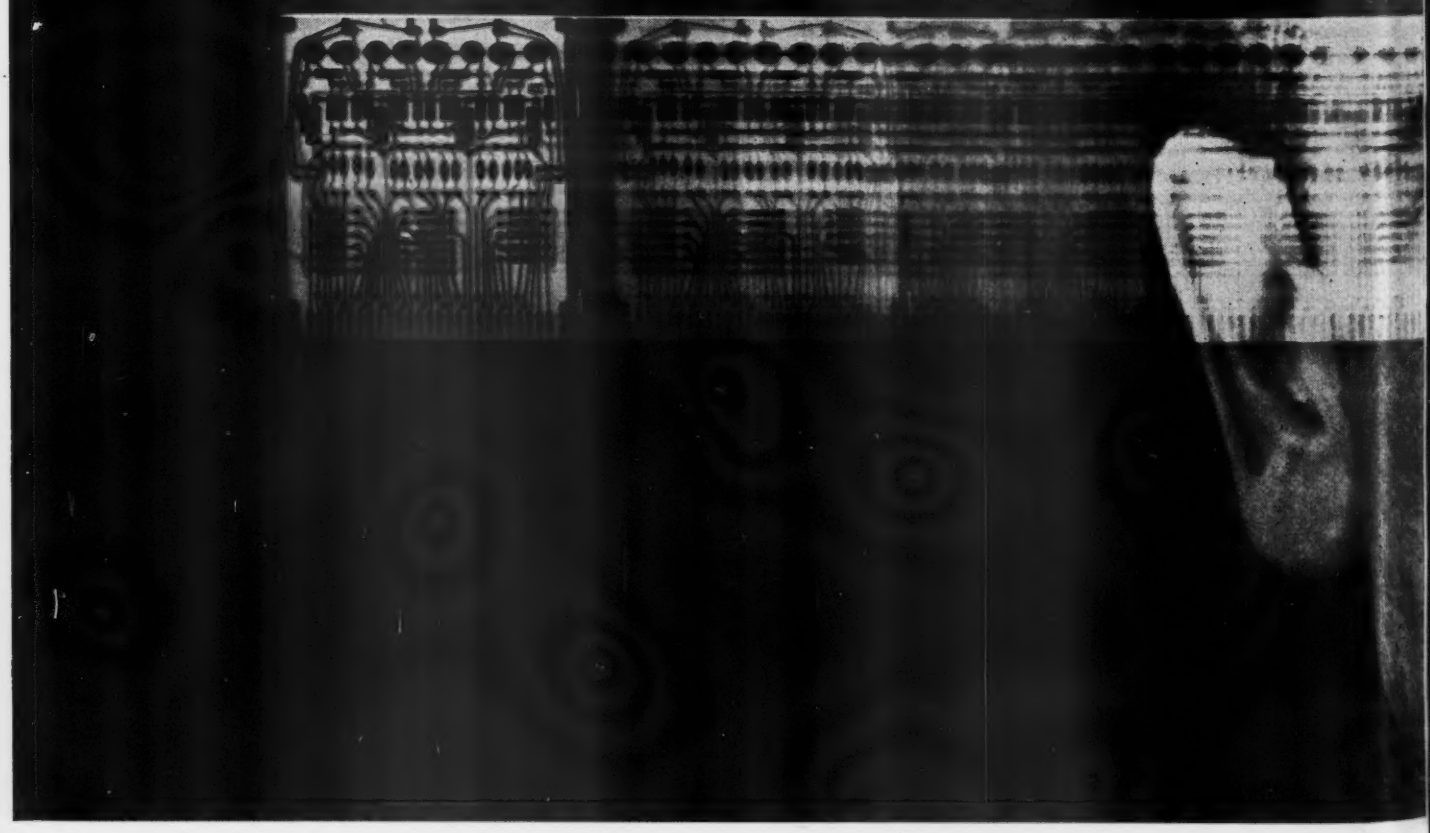

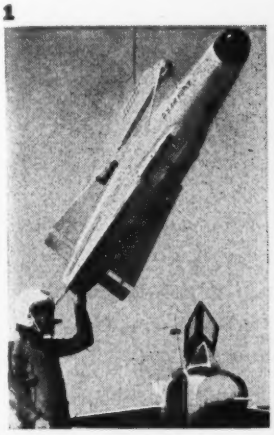

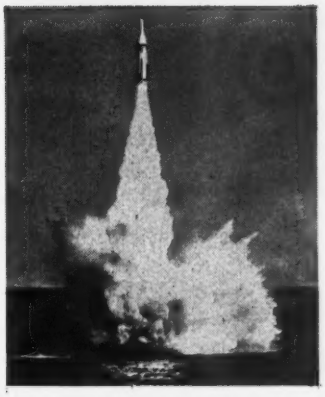

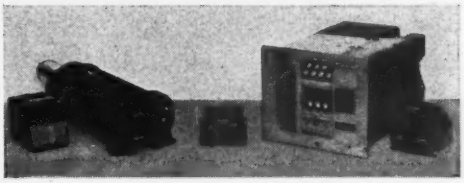

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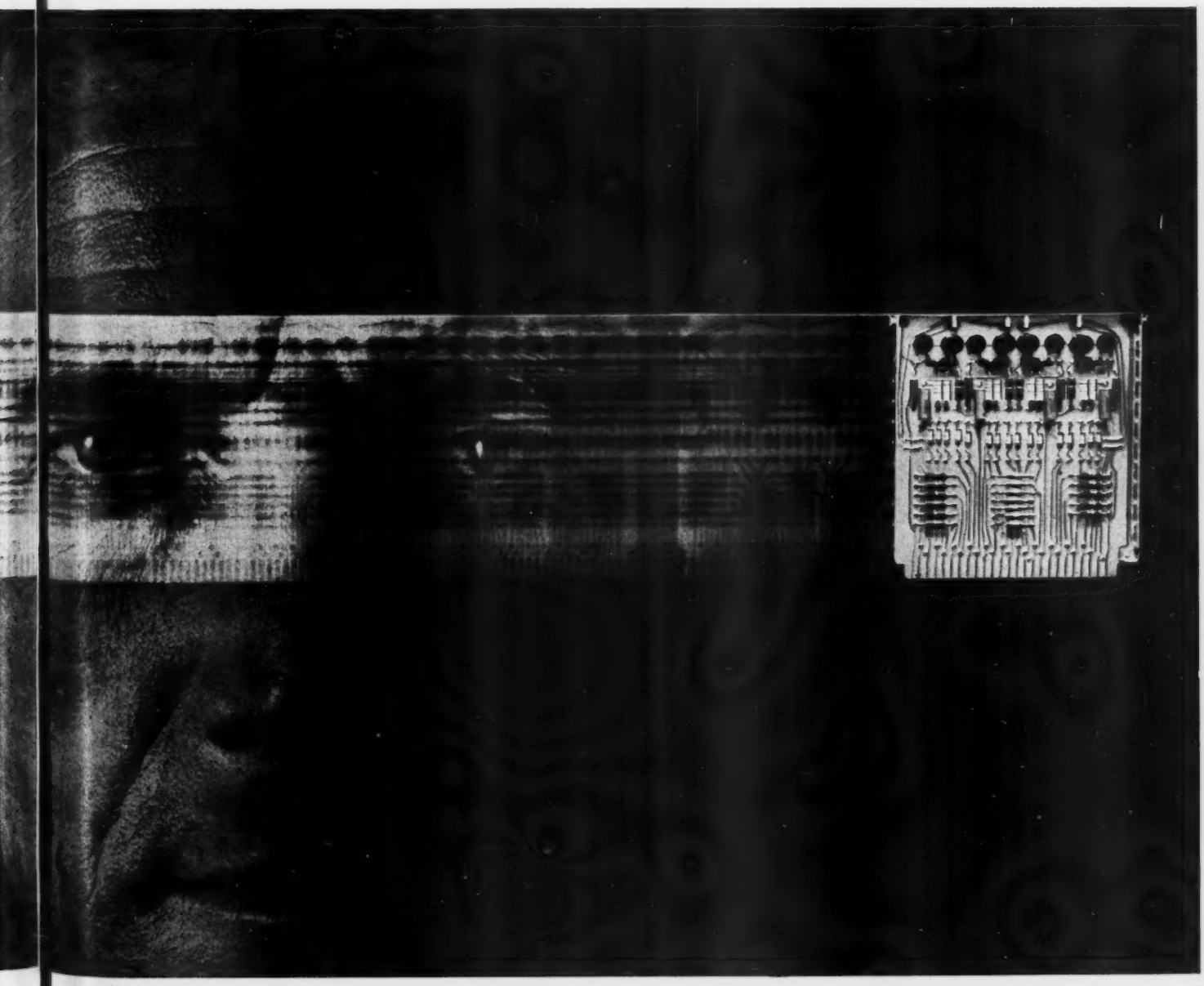

USAF SCHOOL FOR SPACE PILOTS

PROBLEM: **Build-up of a well trained cadre of space research pilots to prove out tomorrow's manned aerospace systems.**

PROPOSED SOLUTION: **Use augmented, *existing* facilities which are already producing today's top test pilots . . .**

MAN—properly trained—is the indispensable ingredient in purposeful spaceflight. No matter how hard the engineers work on the problem of creating reliable hardware, the country is increasingly going to need a nucleus of highly skilled and versatile space research pilots.

To meet this requirement, the nation's most experienced test pilot training facility—the Air Force's Experimental Test Pilot School at Edwards AFB, Calif., part of Air Research and Development Command—has put finishing touches on a forward-looking new training proposal it hopes to get into operation by June of this year.

Already approved at ARDC headquarters and awaiting action at Air Staff level, the proposed changes call for addition of a new Space Research Pilot Course at Edwards, to be offered approximately once a year initially, beginning in June 1961.

The Space Research Pilot Course would be separate and distinct from the existing Experimental Test Pilot Course, which would be continued with some slight modifications. But the new course would draw its students from among the most highly qualified, experienced, and motivated graduates of the Experimental Test Pilot Course.

The proposed new curriculum is included in an updated version of a school study entitled "Future Requirements for Test Pilot Training," which was conducted by the Test Pilot School Commandant in December 1959 to examine training needs for the period 1960-65. The plan also calls for

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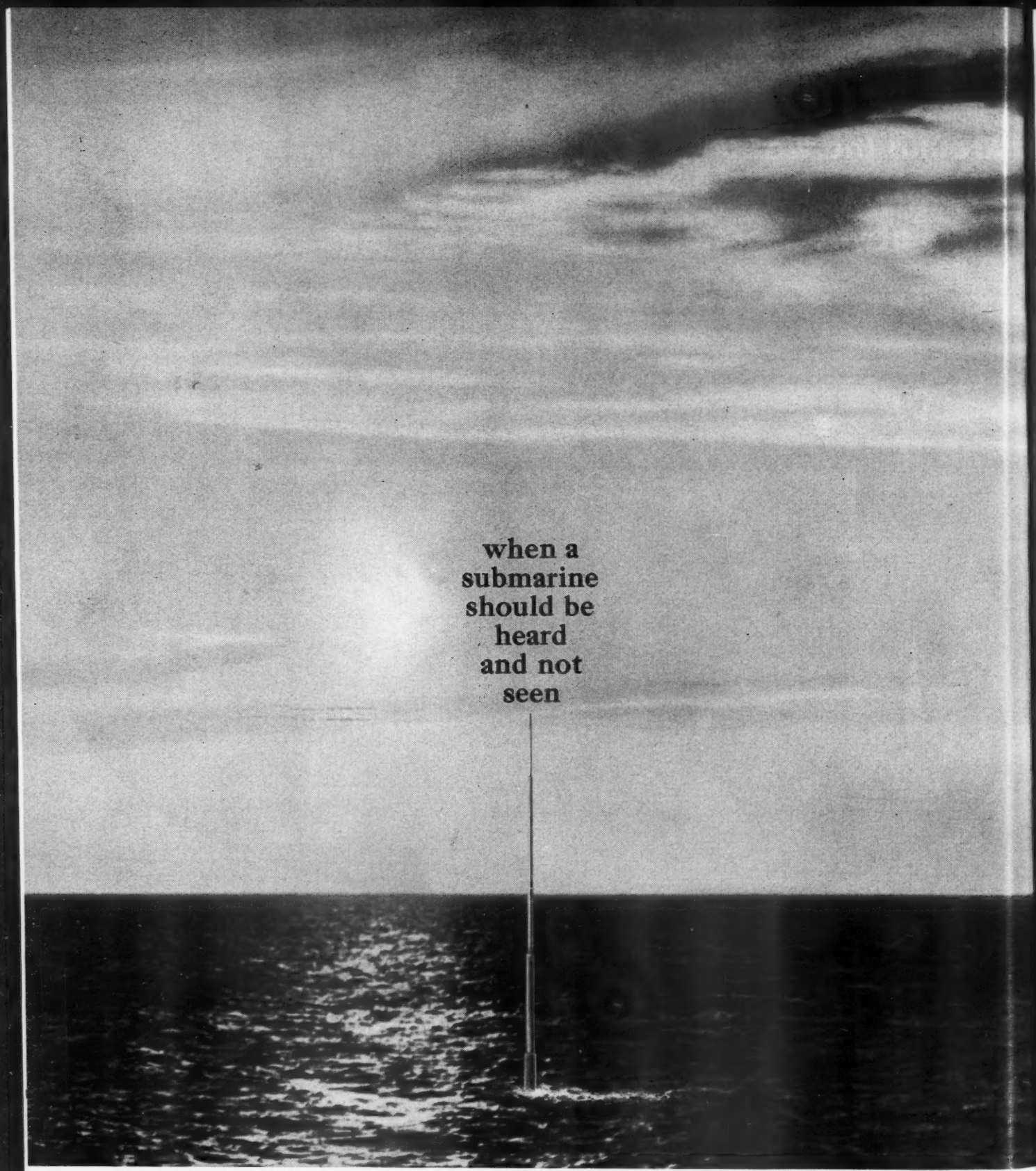

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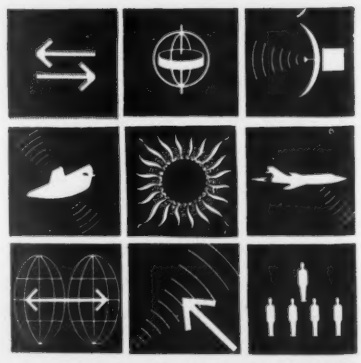

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changing the name of the Test Pilot School to the "Aerospace Research Pilot School." The new designation is suggested "to adequately reflect the dual training functions in aircraft testing and manned space vehicle testing."

Why a Space Research Pilot Course at this juncture—when US man-in-space efforts are still at least months from being proved out?

School planners reason that the Air Force and the nation are committed to manned spacecraft programs, over and above the Mercury Astronaut program. X-15, Dyna-Soar, and concepts such as the Aerospace Plane (*see* AIR FORCE, *January '61*) now under Air Force study indicate the crowded future of manned aerospace flight.

The study notes: ". . . a review of future planned systems indicates that development action on a number of additional programs is forecast to commence in the 1963-65 time period. Since it is planned to assign test pilots to specific projects as early as possible in the development cycle, the requirement for space-oriented pilots is immediate and will increase as development activity advances."

The Space Research Pilot Course, planned to cover a twenty-four-week period, is designed to give students specialized academic training in the astronautical sciences, flying training in high-performance craft, plus physiological training. Of the twenty-four weeks planned for the initial courses, four weeks are scheduled for medical and physiological screening, pressure-suit fitting, and training. Two weeks would be devoted to field trips, and the remaining eighteen weeks would be spent on flying and academic activities. Present plans call for the first two courses to train eight students each, with the number to be increased to ten in each course starting with the January 1963 course.

Although these numbers of students are expected to exceed immediate Air Force requirements, school planners consider that the trained nucleus will be "money in the bank" because the Air Force will be assured of a number of highly qualified pilots available for assignment to space research programs as they develop—an application of the concept of concurrency in the vital personnel field. The graduates will have completed both the regular Experimental Test Pilot Course and the new Space Research Pilot Course and will have a unique set of credentials, and the planned number of graduates can be accommodated without additional facilities.

TEST SCHOOL PLANS

The plan for a Space Research Pilot Course in no way indicates any radical changes or cutback in the existing Experimental Test Pilot School at Edwards, which has earned in past years a high reputation for its achievements as one of the top such facilities in the entire world.

The proposal calls for continuation of two Experimental Test Pilot Courses per year with an expected annual total of thirty-two graduates. This number would fall slightly short of the projected annual average requirement, but planners feel that adjustment of tours in testing assignments and maximum economy in the utilization of the personnel would provide the needed numbers of test personnel for ARDC requirements, as well as other Air Force commands, for contractors and the Federal Aviation Agency, for allied nations, and for requirements by the Army.

It is also suggested in the proposal that—since Army pilots receive specialized training for their missions—whenever a requirement is generated for a sufficient number of Army pilots to fill an entire class, an Army class might be substituted for a regular class.

Some aircraft inventory changes are contemplated at the Experimental Test Pilot School. As four T-38s are acquired, two of the present T-33s will be released, leaving four T-33s through 1965. The one delta wing TF-102 will be retained, for the present, to be used for tests where flying characteristics differ greatly from conventionally winged aircraft. Eventually the school's lone TF-102 will be phased out. T-28s, which are being phased out of the Air Force, will be phased out at the school when the T-38s and U-3As are delivered.

The school's three B-57s are expected to be needed through 1965. The two F-104s will be used in both Space Research and Experimental Test Pilot Courses. The two remaining F-86s will be phased out. The helicopter training capability, using an H-43, which was developed in 1960 for a class of Army pilots, is expected to be retained, in view of its application to over-all flight training and to VTOL training. And the U-3A, will be used to provide fundamental training prior to more complex work in higher-performance aircraft.—END

In anticipation of increasing needs, there is leeway in planning for the later possible inclusion of officers from other services, contractor pilots, and pilots from foreign countries.

What would "space pilot school" be like? A sampling from the proposed curriculum suggests the intensive study that would be crammed into the proposed twenty-four-week course.

In the academic regimen, such items as Newtonian mechanics, thermodynamics, fluid mechanics, boundary-layer theory, high-speed aerodynamics, aerodynamic heating, heat transfer, dynamics of rarefied gasses, relativistic effects, differential equations, and vector analysis, would take up the thirty-eight hours of general-theory.

On the applied theory side, ninety hours would be devoted to physics of the upper atmosphere, propulsion systems, orbital mechanics, stability and control, vehicle performance, vehicle systems, man in space, instrumentation, astronomy, navigation and communication, meteorology, and computer techniques.

Some of these subjects will have been partially covered in the existing Experimental Test Pilot Course, so Space Research Pilot Course students will have an academic base on which to build as they move through their program.

Field trips would include visits to contractor research, manufacturing and test facilities, also to the Directorate of Rocket Propulsion and Missiles, the National Aeronautics and Space Administration Flight Research Center, the X-15 High Range Control and Data Handling Facility, the Flight Test Engineering Division—all in the Edwards complex—and trips to Vandenberg AFB, Calif., and to the Langley AFB, Va., facility of NASA, where the NASA Space Task Group in charge of the Project Mercury manned orbital mission is headquartered.

Seminars would be held on the weapon systems concept, research and development program structure, systems managements procedures, the X-15 and Dyna-Soar programs, NASA flight research programs, and Project Mercury.

The flying training program would use the Northrop T-38 two-seat jet trainer for stability and control investigation, and Lockheed F-104Bs and Cs for studies including zero-gravity flight, simulated power-off low lift-drag landings (to give practice in landings characteristic of lifting reentry vehicles), reaction control, and evaluation of flight trajectories. The above regimen is only a partial list of the training that would be given with the T-38s and F-104s. Planners feel that both the F-104 and the T-38 offer—with minor modification to the aircraft in some cases—considerable potential in space pilot training.

In addition, planners want eventually—for those studies which can only be marginally explored in conventional airplanes—a "space trainer." For this need, they visualize a two-place X-15.

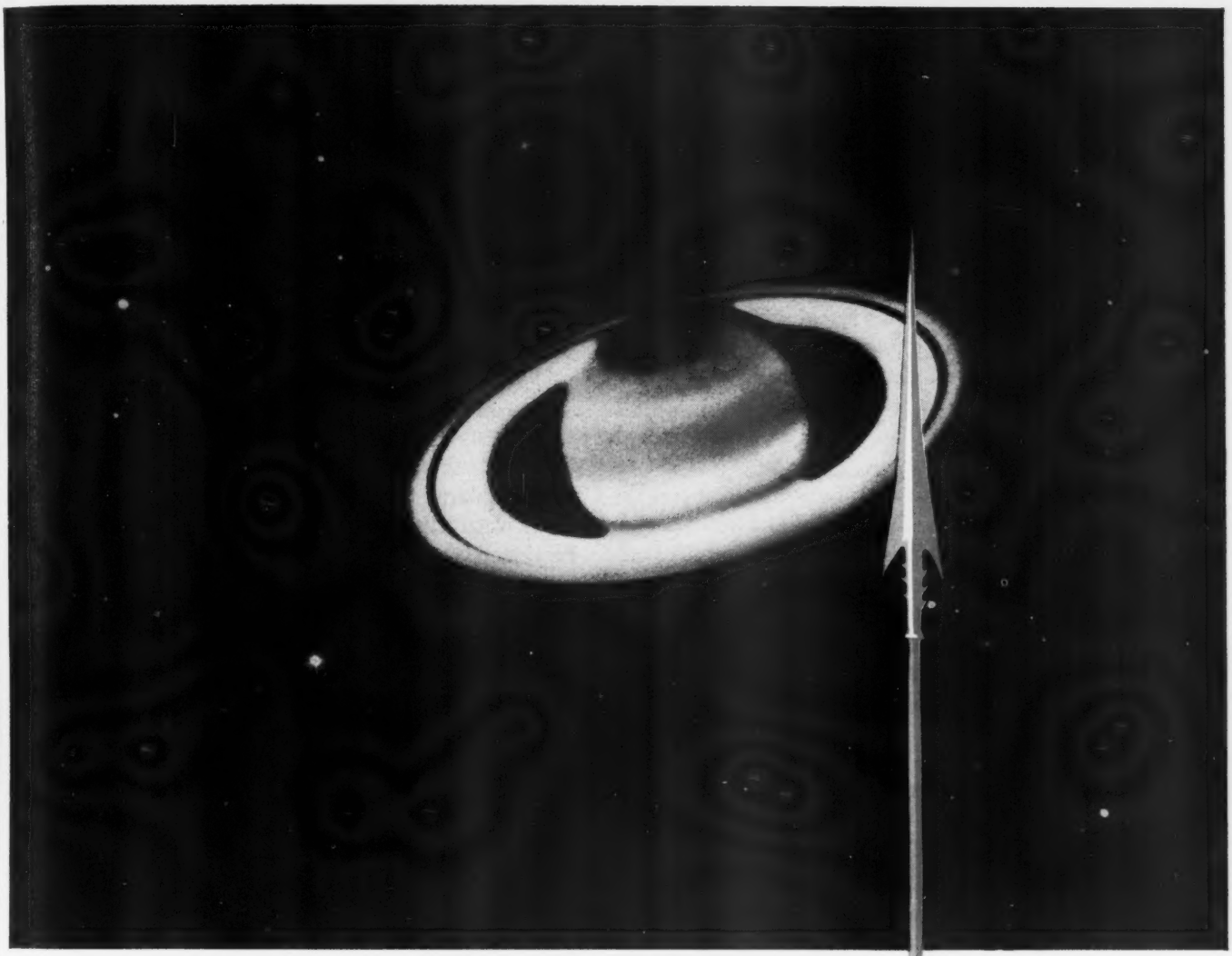
As the study remarks:

"While the cost of a training vehicle with near spaceflight capability, such as a two-place X-15, would be considerably greater than for any other aircraft previously used in test pilot training, the benefits derived from such a vehicle should more than compensate for this cost. A pilot with training and experience in the unique functions he will encounter in spaceflight will be capable of contributing substantially more to the conduct of a space research program than he would otherwise. When the cost of procuring and operating a space trainer is considered against the cost of a single space research mission, the relative value of the space trainer becomes evident. If the training a pilot thus received assured just one additional successful mission per project, the space trainer would have more than paid for itself."

One item school planners are paying heavy attention to as they chart the addition of the Space Research Pilot Course is that of quality of instruction. This need applies equally to the continuing Experimental Test Pilot Course.

The study points out: ". . . Instructors are responsible for both academic and flying training, and therefore, must be highly proficient in both areas. . . . With the broadened scope of material that will accompany the start of the proposed Space Research Pilot Course, an even more selective process than has been employed in the past must be used in choosing instructors. Initially, it will be necessary to select from existing personnel sources, and only a limited amount of specialized preparation can be afforded the instructor personnel. Future replacements, however, should be products of a well organized selection and preparation process. Essential elements of this preparation should be a high level of formal education in astronautics and related fields and experience in experimental flight testing. The competence of the instructor personnel will not have much influence on the number of students that can be trained but will strongly influence the quality of the graduates, and in turn, the capability of the course in achieving its intended objective."

—WILLIAM LEAVITT



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Speaking of SPACE

WILLIAM LEAVITT
Associate Editor, SPACE DIGEST

Space-Age President—and Vice President in Charge of Space

By now, with all the not inconsiderable pomp this republic can muster, John F. Kennedy has been installed as the nation's thirty-fifth President and is examining the almost unbelievable accumulation of problems facing the country in this fourth year of the space age.

Lyndon Johnson, President John F. Kennedy's Vice President in charge of space.

On the astronautical front, there is strong evidence that President Kennedy will take a far more active role in the formulation of space policy than did his predecessor. It seems certain that the new Chief Executive will give a careful hearing to those who for a matter of years now have called for realistic approaches to the national space effort in terms of its potential as an extension of national physical and symbolic power.

Even before his inauguration, Mr. Kennedy indicated his interest in and concern about space policy by assigning a special study group headed by Massachusetts Institute of Technology professor, Jerome B. Wiesner, to prepare a report (*see page 6*) on the national space effort. Since then Professor Wiesner has been named Special Assistant to the President for Science and Technology.

The new President's apparent intention to focus policy-making of space matters at the highest levels was further underscored by his naming Vice President Lyndon Johnson to be chairman of the previously moribund National Aeronautics and Space Council. The Council, created by the 1958 Space Act as the top policy group for space in the Executive Branch, had been practically unused by the Eisenhower Administration.

In view of the activist record of Mr. Johnson, as a senator, notably in the preparedness field and as chairman of the Senate Committee on Aeronautical and Space Sciences, his appointment by the President can be interpreted as a precursor of change in the government's approach to and organization of the national space effort.

Mr. Johnson has become, in effect, vice president in charge of space, and he indicated at the time of his designation as Space Council chairman that Mr. Kennedy wanted the national space program gone over with a "fine-tooth comb." This is not the sort of exercise that is accomplished overnight. Nor does it lend itself to the glare of publicity that attends public legislative hearings. Hence it is a good bet that, although both House and Senate space committees will, for their part, do a lot of questioning in the 1961 session, the close study of space programs and policies under the Vice President's aegis will be quietly performed, and will last several months.

Aiding Mr. Johnson in his analysis presumably will be a beefed-up staff for the Space Council, some of whom may come over from the Senate space committee of which he was chairman during the previous Administration.

The Vice President's job is cut out for him, and his appointment was generally well received in the press. As the Washington *Post* remarked editorially at the time of his appointment:

"By naming Lyndon Johnson chairman of the . . . Council . . . President-Elect Kennedy has

given the government's space programs two of the several things which they urgently require: the promise of top-level attention and the hope of improved coordination. This is a field that the Vice President-Elect understands, particularly in its important political and psychological implications, and it is one much in need of his talents for conciliation and leadership.

"The Space Council has met only once in the past year, and it has never been properly staffed. The Air Force on the one hand and the National Aeronautics and Space Administration on the other have been left to fight out their battles for jurisdiction and funds without the over-all management which the Council was created by Congress to provide. The result has been waste in some fields, delays in others, and in general a space program unworthy of the world's most advanced scientific society."

Among the questions high on the Vice President's priority list for study is certainly the matter of the military mission in space. The Council must determine whether the mission is to be recognized, and if so, how it can be organized in the Department of Defense and vis-à-vis the National Aeronautics and Space Administration.

Mr. Johnson is noted for his realism. It is probable that he will be unreceptive to the weak but loud arguments of those who claim that our international prestige will suffer if we proceed with viable military space developments. This argument, heard so often in the years since Sputnik, has been a variation of the ancient theme that there is something profane about work done by people in uniform or working for the military, as opposed to a kind of holiness associated with purely "civilian" science.

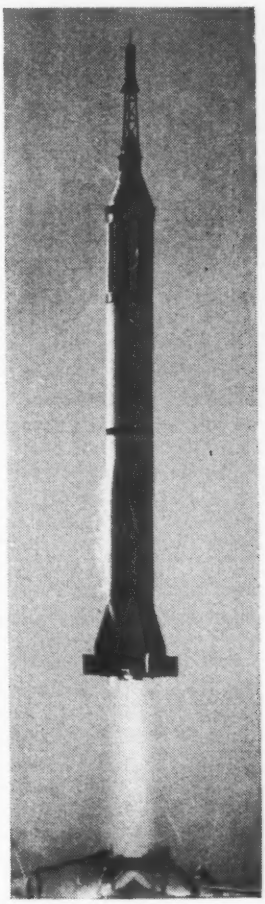
But beyond the vastly important question of assuring national military capability in space, a need that must be filled despite accusations that those who argue for the mission are—in the words of the *Saturday Review's* science editor, John Lear —"space-war hucksters," there are other important problems that must be reviewed by the Vice President and the Space Council.

One of these—and it is only beginning to get the attention it has deserved—is the question of communications via space. This matter is extremely complex. Yet in the closing months of the Eisenhower Administration, it was handled in what seemed an almost cavalier manner.

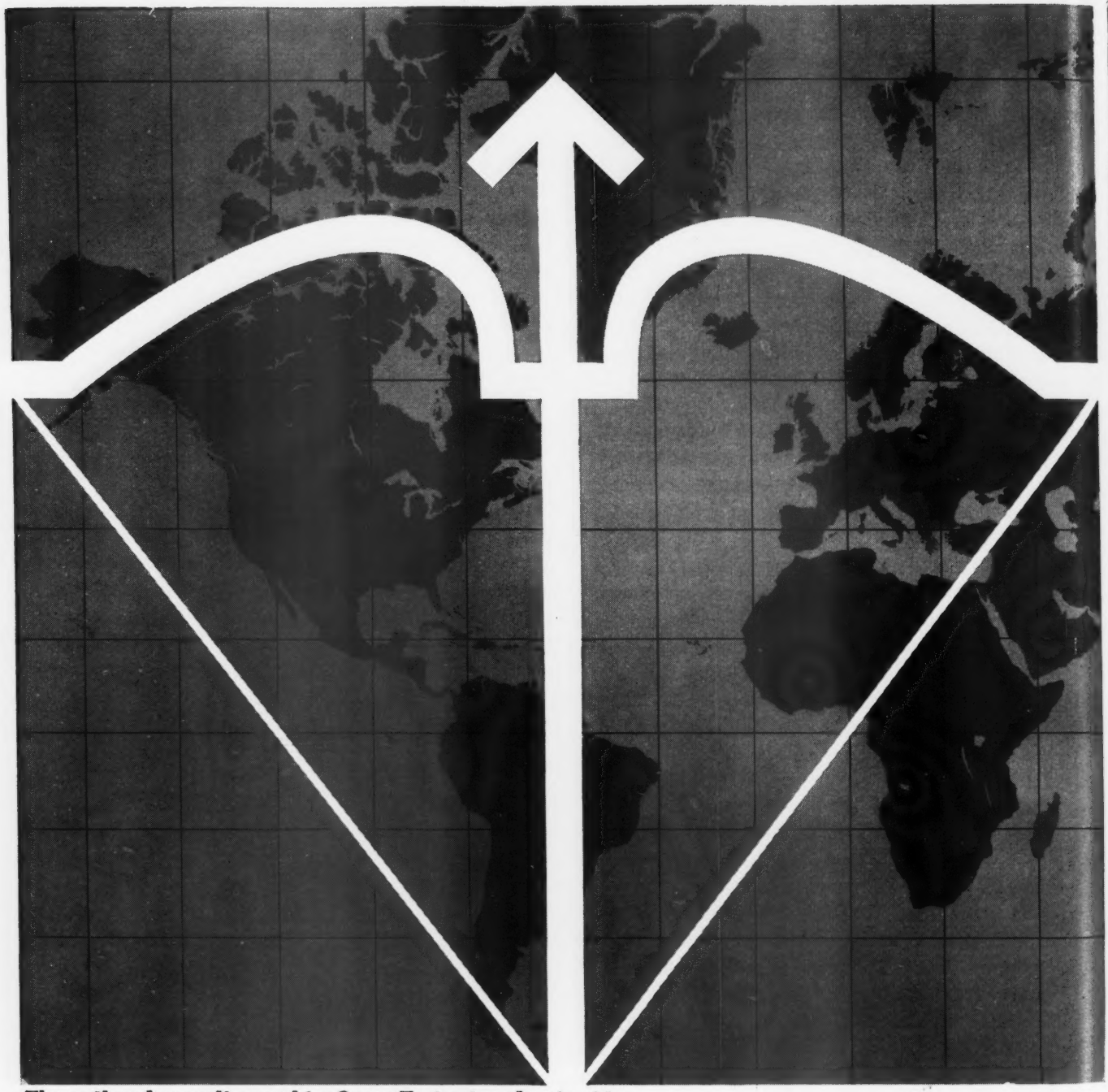
Last fall, the former Administrator of NASA, Keith Glennan, with indications of backing from the Eisenhower Administration, announced a government policy which anticipated the launching at cost of industry-built communications satellites. The apparent idea of this policy was to get private industry into the space communications business as soon as possible and to get the government out of it with almost equal haste. Acting on the announced policy, the American Telephone & Telegraph Company, one of the nation's leading communications enterprises, has already embarked on an ambitious program of planning for a private network of communication satellites that would presumably be an extension of its existing earth-bound operations.

There is nothing at all wrong with the concept of private enterprise operating in space. Under our system, nothing could be more desirable—once the country, through its government, has determined what it wants in the way of communications via space. And no one would deny the great industrial capability in such technical areas, not only in AT&T, but in myriad other companies which have already contributed so much to US technological advance, both military and civilian.

But some attention ought to be paid now to the question of whether it is a good idea to advance headlong toward a privately run US spaceborne



Symbol of country's hopes for manned orbital mission, Project Mercury's schedule calls for manned ballistic trajectory flight in 1961. Shown is successful December 19 launch of capsule in ballistic trajectory aboard a Redstone.



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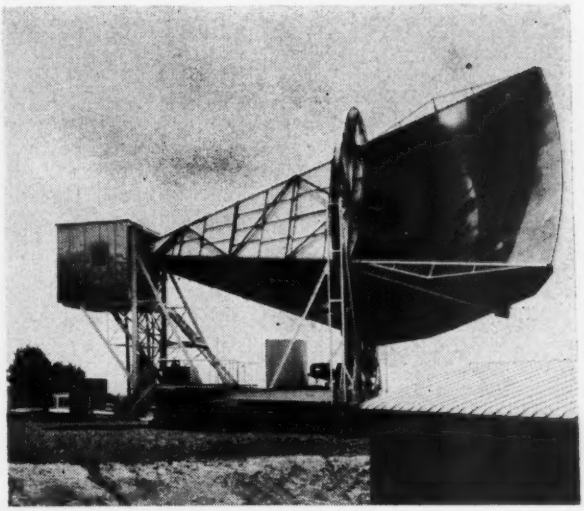


Bell Telephone Laboratories "telephone terminal to outer space" at Holmdel, N. J. Shown is horn reflector antenna developed by the AT&T Bell Labs for use as part of satellite communication project which the company now has under study.

communications network, without firm decisions —in consultation with industry—on national needs, as well as international ramifications.

The general subject of space communications was the subject of a recent study by the staff of the Senate space committee, so the Vice President is undoubtedly apprised of the complexity of the problem.

In fact, it was he who, while still a senator during the former Administration, was among the first to demand of Mr. Glennan whether or not Mr. Glennan's announcement represented official government policy.

The problem should provide fruitful additional study for the Vice President and the Council.

Military's Strong Man-In-Space Biomedical Capability Cited by House Space Committee Member

The contention by NASA, during last summer's hearings before the House space committee, that the military, notably Air Force and Navy, had an admittedly strong bioengineering capability applicable to man-in-space studies, but was short on *basic* bioscience capability, has been challenged by Rep. Emilio Q. Daddario, Democrat of Connecticut, who has taken a strong interest in US life science as applied to man-in-space efforts.

Representative Daddario, reporting to the House space committee after a personal investigation of military research installations, says that he finds NASA's contentions not borne out by the evidence.

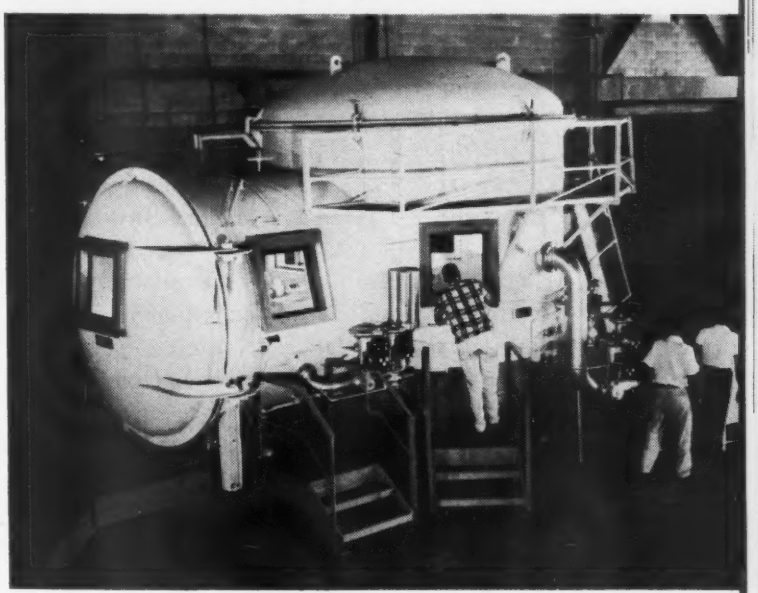
NASA, during last summer's hearings in the House on the question of NASA's desire to build up new facilities of its own for space medical research, had argued that what it called the military's lack of basic biological science capability needed to be corrected by establishment of such a capability in NASA.

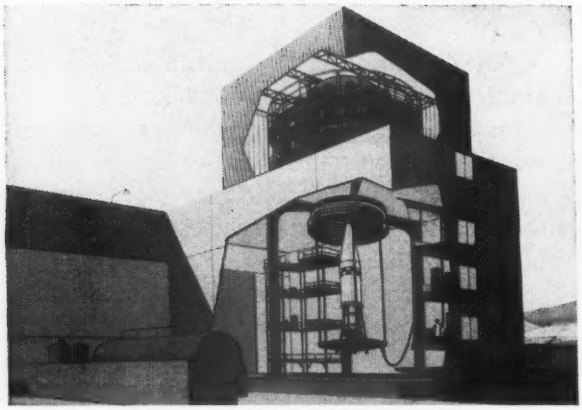
Mr. Daddario indicated in his report that he continued in his previously expressed view that the best way to get the man-in-space job done is to use existing skills and facilities under a system where NASA would pass on its space medical requirements to the military laboratories, where they would be filled, presumably on a high-priority basis.

Some Slippage—But "Proceeding Satisfactorily"

Project Mercury, the NASA manned orbital mission project, which at this writing awaited the first ballistic flight by a chimpanzee—probably one of those trained at the Air Force's Holloman AFB, N. M.—is "proceeding satisfactorily," according to a recent progress report on the project issued by the House space committee. "Some slippage has occurred," the report adds, "but it is not out of line when considering the complexity

This device, a high-altitude simulator developed for Project Mercury by the Tenney Engineering Company, Union, N. J., can take Astronauts in the Mercury capsule to a simulated 225,000 feet, while reactions are studied from the outside.





Lockheed scientists plan to bring space down to earth in this High Vacuum Orbital Simulator. HIVOS will be able to duplicate heat and cold conditions in space, will be used to test hardware for orbital missions, primarily the Agena engine.

of the development and past history of other large research and development programs."

Hearings by the committee, according to the report, will be held during the first session of the new Congress, shortly after the first manned suborbital ballistic shot, which is expected in March or April of this year. The timing of that crucial shot will of course depend on the success or failure of the chimpanzee ride shot which you may have read about by the time this appears.

The committee report's general optimism on the Mercury project does not square with the views expressed in the Wiesner report, which suggests that Mercury may be marginal and that its booster may not even be able to do the job.

Space Capsules

Readers interested in other sections of the Brookings Institution's *Summary of Proposed Studies on the Implications of Peaceful Space Activities for Human Affairs,* one section of which appears on page 59 of this month's SPACE DIGEST, can write to Dr. Donald Michael, Brookings Institution, 1775 Massachusetts Ave., N. W., Washington, D. C., to inquire on availability of copies of the report. The nine-section summary includes sections on implications of satellite-based communications systems, implications of technological by-products, implications of space advances for industry, implications of space efforts for foreign policy, among other items. . . . A worthwhile fifty-cent paperback book investment for your science-minded youngster is the *Science Projects Handbook,* edited by *Shirley Moore* of the Science Clubs of America and published by Ballantine Books. It gives some handy hints on how to start a science project and describes many projects successfully completed by youngsters for science fairs and the like.

Boeing scientists have "heat mapped" the moon with infrared detectors and found evidence to suggest that the layer of lunar dust is not uniform. Their observations, made during the two lunar eclipses in 1960, indicate that some moon craters retain solar heat much longer than do the plains of the "sea" area on the moon. Such nonuniformity might require special planning for lunar landings to make sure that impact sites are of the proper texture to allow for maximum safety. The added indicated heat in the craters could be interpreted also to mean that the moon still has volcanic activity, but the scientists point out this would mean drastic revision of existing theories that the moon has not been volcanically active for four billion years. Other interpretations of the crater heat: radioactivity, or a different composition of the dust in the crater areas.

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We are not dissatisfied with this arrangement.

We believe America is going to meet its many challenges. We are working to meet ours–in the fields of RELIABILITY, QUALITY, ACCURACY.

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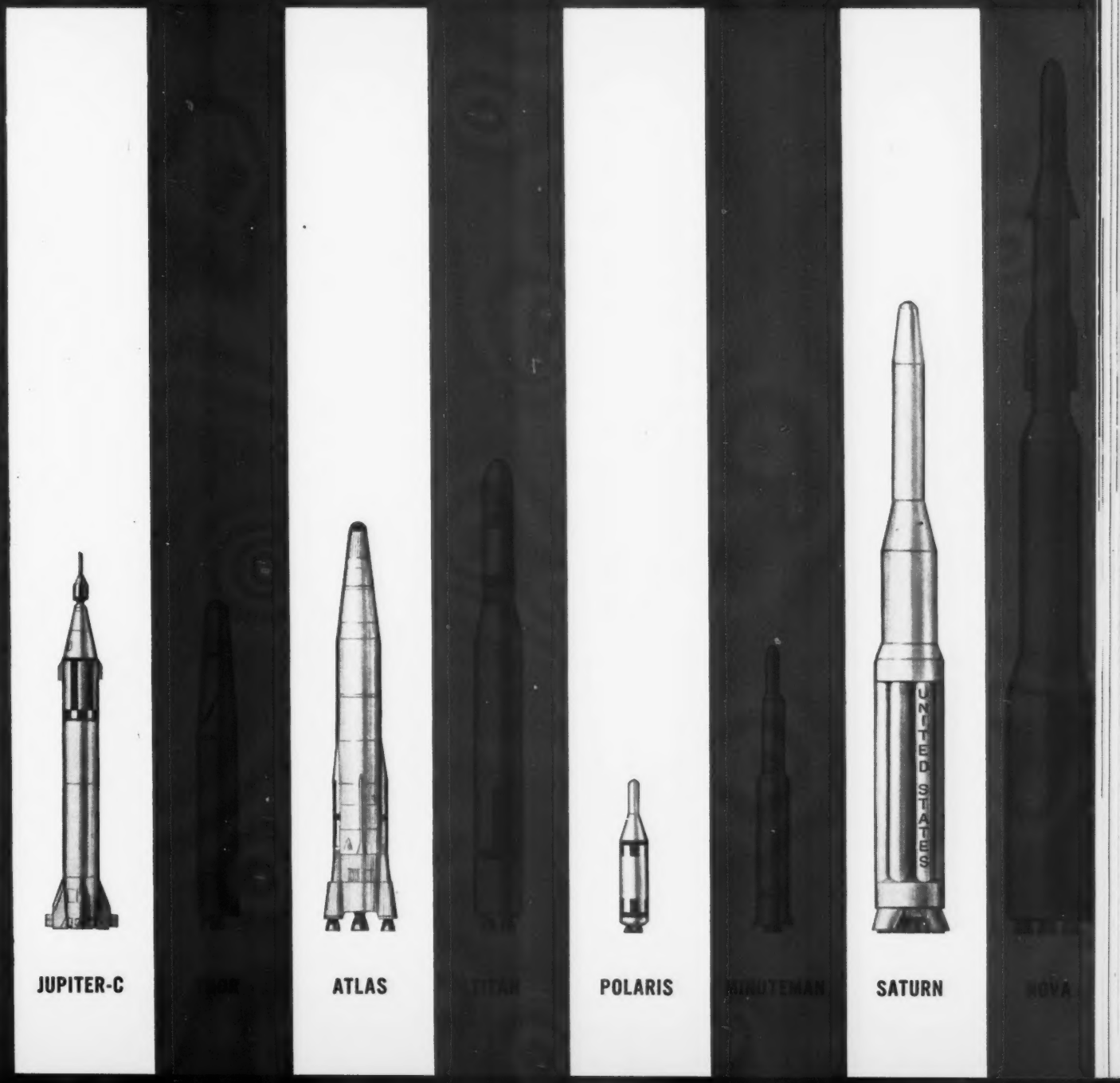

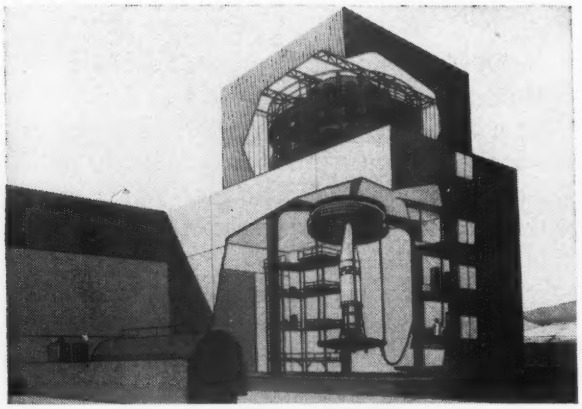

Lockheed scientists plan to bring space down to earth in this High Vacuum Orbital Simulator. HIVOS will be able to duplicate heat and cold conditions in space, will be used to test hardware for orbital missions, primarily the Agena engine.

of the development and past history of other large research and development programs."

Hearings by the committee, according to the report, will be held during the first session of the new Congress, shortly after the first manned suborbital ballistic shot, which is expected in March or April of this year. The timing of that crucial shot will of course depend on the success or failure of the chimpanzee ride shot which you may have read about by the time this appears.

The committee report's general optimism on the Mercury project does not square with the views expressed in the Wiesner report, which suggests that Mercury may be marginal and that its booster may not even be able to do the job.

Space Capsules

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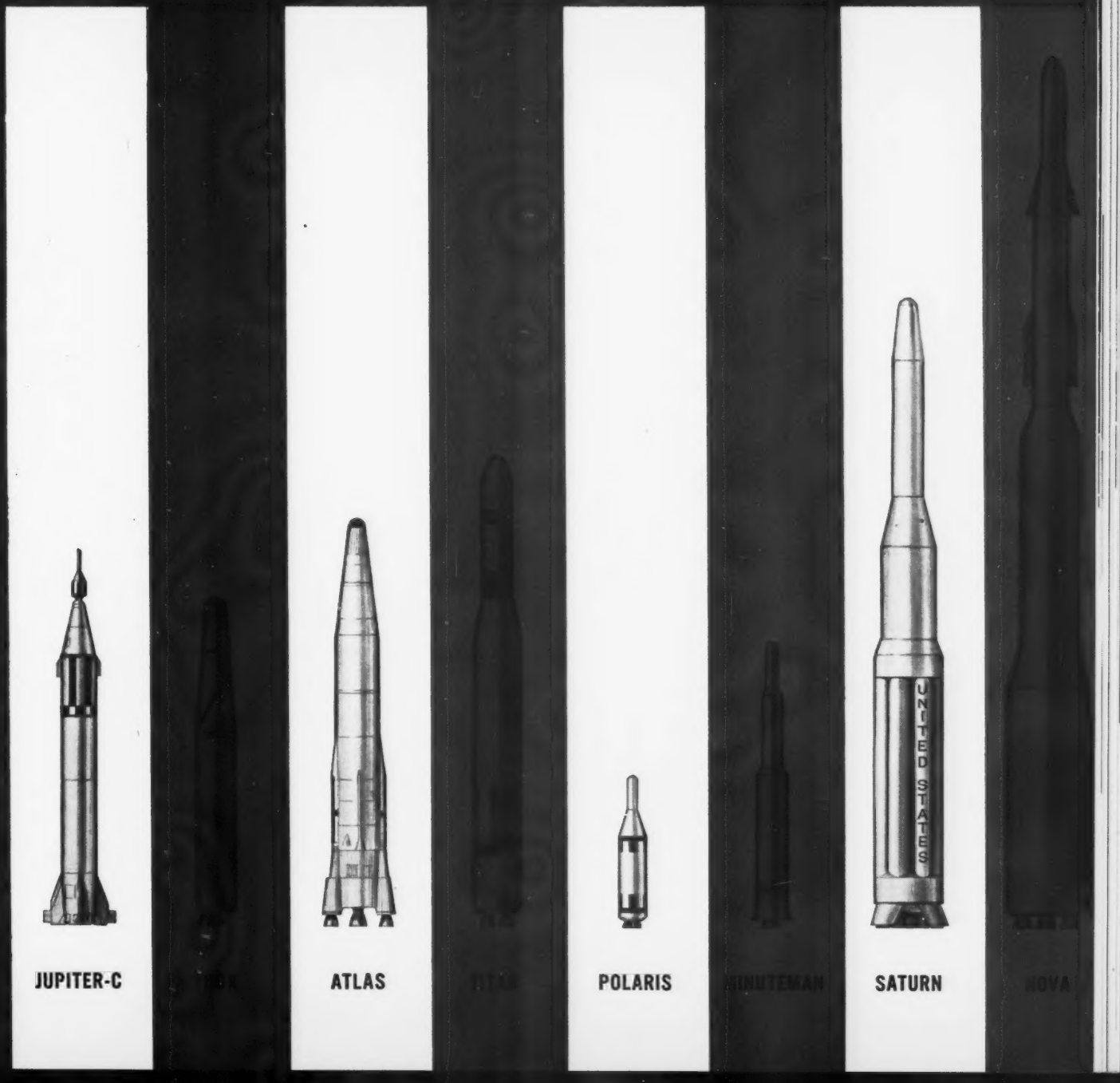

JUPITER-C ATLAS POLARIS SATURN

instant intelligence for task force tactics

New Data Interchange System Tightens Naval Fleet Coordination The new Naval Tactical Data System will permit a task force, dispersed over a 300 mile area, to be operated by its commander with the same flexibility and tactical control he exercises over his flagship. Information from radar, sonar and other sensing sources gathered by all surface and airborne elements of the task force will be continuously displayed, providing intelligence for directing missile-launching functions, reconnaissance operations and tactical maneuvers.

Alpha is providing system engineering and management for the channeling of the intelligence data from each unit's computer and the transmitting by single sideband radio to like computers in each other unit of the force. This computer-to-computer instant sharing of intelligence is the heart of NTDS.

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Above, a missile-launch mishap. Drill with specially-designed USAF trainer aims to guard against such events.

A one-of-a-kind space-shot simulator at Vandenberg AFB, Calif., trains Strategic Air Command personnel in the tense complexity of sending Atlas missiles on their way. The Atlas Crew Procedures Trainer has saved millions while providing trained missilemen for USAF . . .

EMERGENCIES MADE TO ORDER

TSgt. James R. Doherty

PHOTOS BY SMSGT. WILLIAM E. LUMMUS

WITH blastoff only seconds away, the young launch control officer was shaken. And small wonder. In the last few minutes, as the hands of the countdown clock spun inexorably toward zero, "everything" had gone wrong.

The trouble had begun with a seemingly minor malfunction somewhere in the fuel system of the giant Atlas ICBM. Then, with a dismaying suddenness, the heretofore-sane console at which the officer sat had apparently taken leave of its electronic senses.

One by one, the panel lights on the console's tilted face had flashed from green to red. And each new trouble indication had called for another million-dollar decision from the distraught missileman.

But his crew had responded like veterans. One by one, the malfunctions had been resolved. Now, as he reached toward a button that would put the Atlas into its "final commit sequence," he noted with surprise that his voice, spilling from the blockhouse public-address system, sounded steady and relaxed.

"This is Launch Control to all stations. Stand by to commit missile number one on my mark. . . . Five . . . four . . . three . . . two . . . one . . . mark!"

(Continued on following page)

Computer work during an Atlas simulator launch with an industry expert supervising airman in training. During actual launch, electronic "brain" plays indispensable role. Here, series of mock problems are fed to airman.

Enlisted technicians hard at work learning to be Atlas missilemen in simulator's control room. At left is model of launch operator's console. Right, second console for missile systems analyst technician, launch troubleshooter.

A moment of silence, then: "This is Launch. The missile is in automatic commit sequence, T-minus-10 seconds. Five . . . four . . . three . . . two . . . one . . . missile release!"

Instinctively, the officer braced himself against the earthquake of sound that should even now be assaulting his ears. And in his mind's eye, he pictured the fiery scene on the nearby launching pad.

At this precise split-second, the monster that had made his morning miserable should be punching its blunted nose cone into the blue. Below it, a half-acre of smoke and flame would already have begun to subside.

Fifteen seconds . . . twenty seconds. By now the missile was a distant forefinger of steel racing across the Pacific heavens.

Consciously, the officer stifled a rising feeling of exhilaration. The launch appeared to have been perfect. But there was still work to be done. He touched the microphone at his throat.

"Guidance, this is Launch. It is now T-plus-30."

He waited. Guidance was ominously slow to answer. The first tinge of foreboding plucked at the LCO's mid-section. Then it came—the last dismal straw in a day gone sour just about from the beginning.

"Launch Control, this is Guidance. I gave you a go-ahead before liftoff but failed to put my computer into a flight-ready condition. We've a bird up there with no brains!"

For a stunned moment, the LCO remained speechless. It was incredible—but had happened (though this situation could *not* happen in an actual launch). Now, however, there was no time to lose.

Quickly, being careful to reserve his opinion about where the brains were lacking, he acknowledged the bad news from Guidance. Then: "Range Safety, this is Launch Control. I have lost tracking and guidance on this missile. Recommend an immediate abort."

The remainder he could only imagine. At this exact instant—had the launch been for real—a million or more taxpayer dollars would be going down the stratospheric drain.

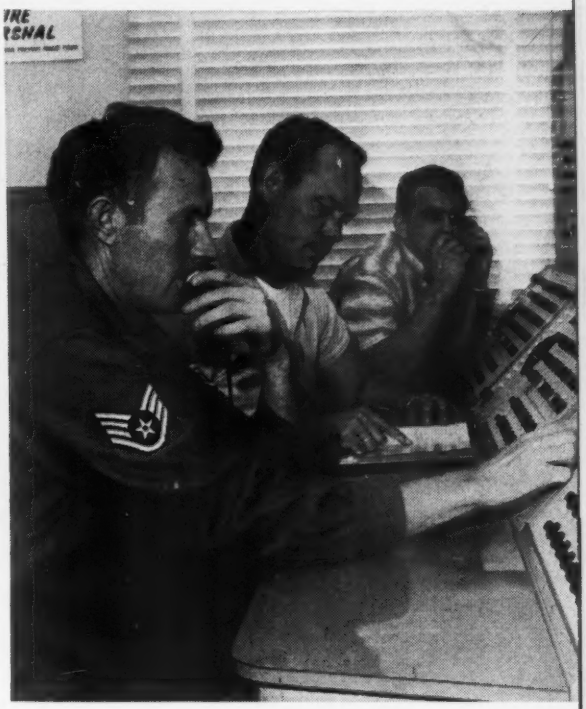
Somewhere, unseen and unheard in the cold twilight of inner space, the missile would be dying. To execute it, the Range Safety Officer had only to trigger an electronic signal. The latter, in turn, would detonate an explosive charge in the missile's final stage.

But today, the taxpayers were getting off easy. The "launch" and subsequent "destruction" of the huge Atlas had cost Uncle Sam less than the price of a ball-park hot dog—for electricity—to operate one of the most amazing training devices in the Strategic Air Command inventory.

Known as the "Atlas Crew Procedures Trainer," the machine is housed in a revamped World War II barracks at Vandenberg AFB, Calif. During the past year, embryo missilemen have used it to simulate the launching of more than 1,800 Atlas ICBMs. Net savings in the cost of missiles: approximately $567 million.

Built to specifications laid down by the Space Technology Laboratories, the two-story trainer is an operational replica, down to the last wire-crammed junction box, of an Atlas blockhouse. In addition, it boasts a guidance center and computer room. Normally these functions, necessary for a missile employing a radio-command "brain," are located some distance from the blockhouse. For training purposes, however, designers of the simulator lumped them under one roof.

The peculiarity that makes the device invaluable is its built-in penchant for going haywire. Operators,



Above, trainees in a practice countdown, launch control officer in the foreground. Simulator's overseer, Capt. Irving Baum, stands at rear. To the right, a view of the simulator's fault-insertion consoles, from which technicians can "bug" simulated launches in dozens of imaginative ways.

for example, can introduce forty-one separate malfunctions into the trainer's launching mechanisms. Guidance students can be confounded with thirty others, while computer circuits can be loused up with a total of nine. All this, of course, in an effort to acquaint budding missileers with the space-age facts of life.

At first glance, the simulator's lower floor looks like the storeroom at an IBM plant. Here, working in a jungle of calculators and consoles, technicians monitor the performance of launch crews laboring in the upstairs "complex." Here, also, the self-confessed "sneaky types" feed their variety of malfunctions into the system.

On the second floor, insulated from one another by distance and acres of glass paneling, launch, guidance, and computer crews sweat it out. As a rule, the rooms are library quiet. Atlas is a highly sophisticated weapon system. Successful launches call for alertness and concentration, with a minimum of chitchat.

The simulator's energetic overseer is Capt. Irving Baum, a thirty-seven-year-old electronics whiz from upstate New York. He is largely responsible for the training program's present high state of effectiveness.

"With the simulator," Captain Baum explains, "we can create the situation we want when we want it. Thus, if a crew's technique is poor in a particular area, we can pour it on them from just that direction.

"And we're immune to such things as hardware slippages here. Our bird is always ready to go. We can announce an 0800 countdown and begin it on schedule. In other words, goals can be set and hit, because our environment can be controlled.

Captain Baum points out another advantage of the simulator, not quite so readily apparent. It concerns the orientation of high-ranking SAC officers.

"Here, without upsetting the readiness routine at our operational complexes, we can give the 'bosses' an idea and some understanding of the problems their people are encountering in the field."

During the average month, Captain Baum plays host to dozens of visiting general officers. These endless briefings are rarely allowed to interfere with training schedules. The "wheels" watch the action through conveniently placed glass panels—and go away sufficiently impressed.

Occasionally, however, visitors sit at the LCO's console and superintend a "launch." SAC's Commander in Chief, Gen. Thomas S. Power, did just this. The General, who pilots his own jet tanker-transport, insists on being checked out thoroughly on each new system as it becomes operational in SAC's arsenal. He has flown every combat-ready aircraft that sports the colorful SAC shield. In this practical fashion, the General acquaints himself firsthand with day-to-day operational difficulties encountered in the field.

The General won his Missileman's badge in precisely the same "do-it-yourself" manner when the Atlas program was in its infancy.

To assist in the trainer's operation and maintenance, Captain Baum has a staff of eleven civilian and military technicians. They include specialists from the Convair Division of the General Dynamics Corporation, the Burroughs Corporation, the Kellogg Switchboard and Supply Company, and General Electric—firms whose equipment is integrated into one section or another of the hybrid simulator.

All are justifiably proud that the gadget is the only one of its kind in existence. It was installed at the big West Coast spaceport in 1959, after SAC's 1st Missile Division, with headquarters at Vandenberg,

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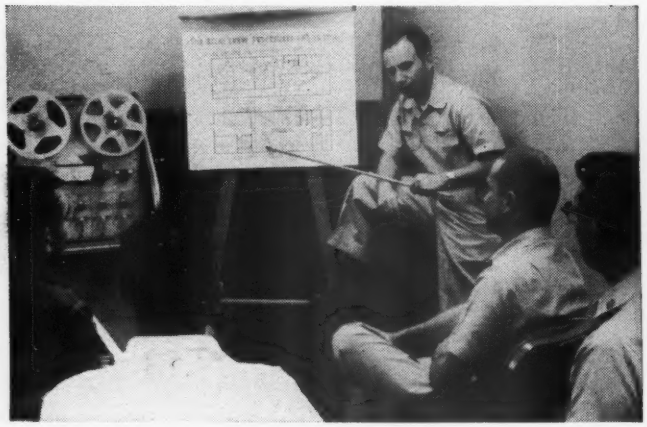


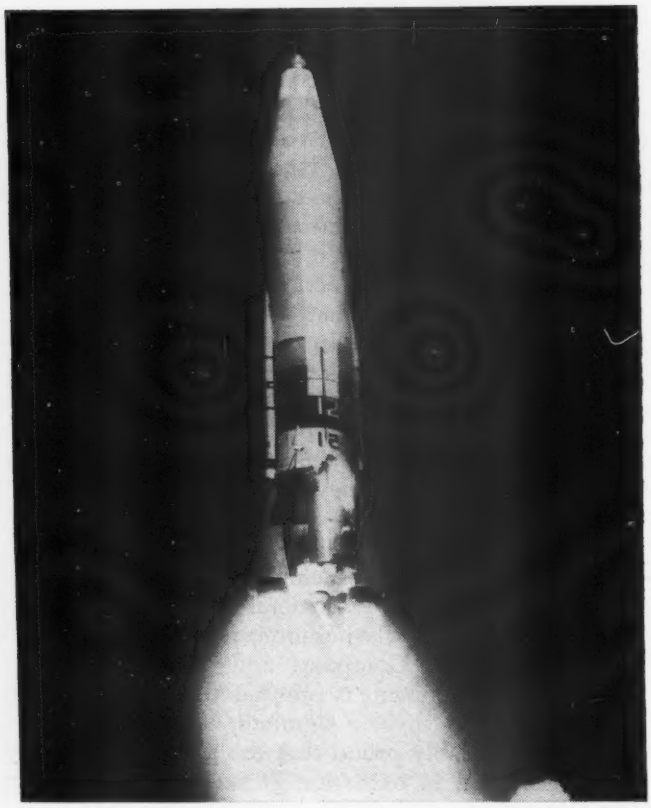
Captain Baum, simulator's officer-in-charge, briefs a group of newly arrived training personnel in use of the Atlas Crew Procedures Trainer, USAF's unique simulator.

Top USAF officers have checked out in simulator. Above, SAC boss, Gen. Thomas S. Power, 1st Missile Division's Col. Rex Dowtin, Division Commander Maj. Gen. David Wade.

had been accorded the responsibility for training all future Atlas missilemen.

Nowadays, Captain Baum's pupils arrive fresh from schools all over the US where they have been thoroughly trained in their specialties. At Vandenberg, they work together as a team for the first time. Their stay lasts ten weeks, which includes forty grueling hours in the simulator.

As part of their trainer indoctrination, crewmen must ingest several hours of concentrated academics, with the emphasis on communications and communications discipline. This is followed by more high-pressure academics in guidance and computer areas.



One Atlas ICBM, outbound. Graduates of the simulator's course compete for chance to participate in an actual firing. A perfect launch is a rich payoff for training.

Next, trainees run through a simple countdown, utilizing one imaginary launching pad as opposed to the three-pad configuration they will encounter at operational bases.

A "simple" launch is next on the docket. Following this team milestone, things begin to get complicated. From here on, through endless multimissile countdowns, they will be plagued with Baum-inspired malfunctions—for which they will be expected to know the solutions instanter.

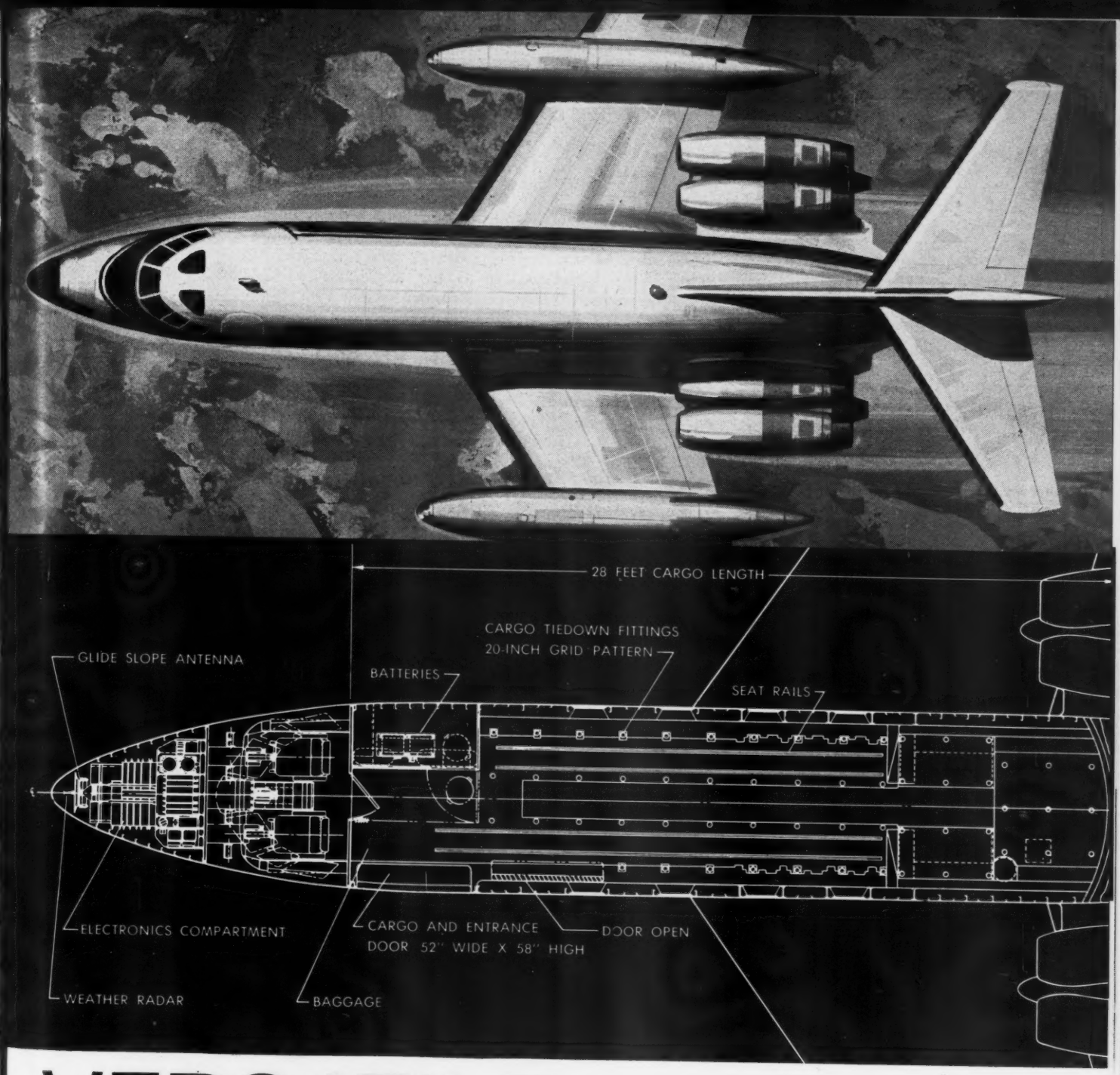
Upon completion of the course, one team among the half-dozen enrolled in each session will be selected to perform an actual launch. It may be the top-rated crew, or it may be the class average. Once, the low team on the scholastic totem pole got the cherished nod.

Present plans call for graduating crews to return annually for simulator refresher courses. Others, slated to take part in SAC's continuing series of actual training launches, will warm up in Captain Baum's ICBM bull pen.

From execution order to liftoff, an Atlas countdown is a step-by-step exercise in precision. To commit it to memory is a task that calls for unexcelled concentration and never-ending practice. The simulator's contribution cannot be overestimated.

Since February 1960 Vandenberg's machine-that-thinks-like-a-missile has been out of commission less than two hours. The fact speaks well for Captain Baum's preventive maintenance program—and bodes ill for those who would make an enemy of America—END

The author, TSgt. James R. Doherty, is an information specialist at SAC Headquarters, Offutt AFB, Neb. He is a veteran of fifteen years of military service, twelve in the Air Force and three in the Coast Guard. During World War II, he flew thirty-five missions as radio operator-waist gunner with the Fifteenth Air Force in Italy. Sergeant Doherty has been a frequent contributor to AIR FORCE/SPACE DIGEST. *His most recent articles in these pages were "Blueprinting Bull's-Eyes for the Ballistic Birds" in November '60 and "Working on the Railroad, SAC Style" in October '60.*



VERSATILE

The Lockheed C-140 JetStar mission-support airplane can be converted quickly for high-priority cargo, standard or high-density passenger seating, aerial ambulance work—or for a combination of all three. This fast, high-flying jet transport can save millions of operational dollars by replacing the obsolete piston-powered airplanes now being used for mission support. Lockheed Aircraft Corporation, Marietta, Georgia.

LOCKHEED GEORGIA

the Ready Room

RESERVE AND AIR GUARD NEWS

Stars in Orbit

Maj. Gen. Harold R. Maddux was named **Vice Commander of Continental Air Command** in January, with duty station at **Robins AFB, Ga.,** to supervise arrangements for moving CONAC's headquarters there by June.

General Maddux, who had been Commander of CONAC's Fifth Reserve Region at Selfridge AFB, Mich., succeeds **Maj. Gen. A. F. Kalberer** as Vice Commander. General Kalberer remains at CONAC's present headquarters at Mitchel AFB, N. Y., as **Assistant to the Commander,** thus in effect giving **Lt. Gen. William E. Hall** two Vice Commanders during the transition from Mitchel to Robins.

Meanwhile, **Maj. Gen. Sory Smith,** Sixth Region Commander at Hamilton AFB, Calif., will become **Chief of Staff** at **Hq. Tactical Air Command,** Langley AFB, Va., in March. He will be succeeded at **Sixth Region** headquarters by **Brig. Gen. George S. Cassady,** now with FAA headquarters in Washington.

Brig. Gen. C. P. (Red) Lessig has been designated to succeed General Maddux as **Fifth Region Commander.** He will report late in June when his present command, the **29th Air Division** at Malmstrom AFB, Mont., is shifted to **Richards-Gebaur AFB, Mo.,** to absorb the 33d Air Division.

New chairman of AFA's Air Guard Council is Brig. Gen. Frank A. Bailey, left, Little Rock, Ark. Col. James H. McPartlin, Selfridge AFB, Mich., heads Reserve Council. Both groups convene for first meeting in Washington on Feb. 3.

AFA Guard, Reserve Councils Named

New membership of **AFA's Air National Guard and Air Force Reserve Councils** has been announced by **AFA President Thos. F. Stack.**

The two councils are convening for their **first meeting** in Washington on **February 3.**

The Air Guard Council, led by **Brig. Gen. Frank A. Bailey** *(see cut),* Little Rock, Ark., includes **Brig. Gens. Vito J. Castellano,** Armonk, N. Y., **Barnie B. McEntire, Jr.,** Columbia, S. C., and **Jack Parsons,** Montgomery, Ala.; **Cols. Roy E. Cooper,** Cheyenne, Wyo., and **Joseph D. Zink,** Linwood, N. J.; **Lt. Cols. Robert P. Knight,** White Bear Lake, Minn., **David F. McCallister,** Swarthmore, Pa., and **John E. Nolan,** Arlington, Mass.; **Capt. Dale J. Hendry,** Nampa, Idaho; and **SMSgt. John A. Petras,** Mt. Holly, N. J.

The **Air Force Reserve Council** is headed by **Col. James H. McPartlin** *(see cut),* Selfridge AFB, Mich., and includes **Brig. Gens. Daniel DeBrier,** Atlantic City, N. J., and **Rollin B. Moore,** Hamilton AFB, Calif.; **Cols. Joseph W. Barron,** Binghamton, N. Y., **Benjamin W. Fridge,** Arlington, Va., **Russell F. Gustke,** Ellington AFB, Tex., **Joseph J. Lingle,** Milwaukee, Wis., and **William D. Price,** Washington, D. C.; **Lt. Col. Frank W. Ward,** Battle Creek, Mich.; **Maj. Billy J. Hinton,** Waco, Tex.; and **MSgt. Francis E. Nowicki,** Wayne, Pa.

More Big Birds for the Guard

A speed-up in **aircraft conversions** should find **five more Air Guard squadrons** equipped with **Boeing C-97 Stratofreighters** by early spring.

In the same period, **four Air Guard squadrons** are to convert to **aeromedical transport missions,** two will acquire **supersonic F-100 aircraft,** and one will change to a **tactical reconnaissance role.**

These changes are among those **reported two months ago** in the December "Ready Room." At that time it was expected the conversions would occur **only after a year or more.** But as a result of **recent changes,** the aircraft are scheduled to go to the Guard in the near future.

The new four-engine transports are **actually KC-97s** being made available as **SAC closes down its training facility at Randolph AFB, Tex.** Guard air and ground crews are already in **transition training** under SAC tutelage at Randolph. As they finish, each crew will **fly home in a KC-97.** There the Guardsmen will **remove the tanker plumbing and restore the planes to transport configuration.**

These planes are going to the **105th Squadron,** Nashville, Tenn.; **128th,** Marietta, Ga.; **155th,** Memphis, Tenn.; **185th,** Oklahoma City, Okla.; and **191st,** Salt Lake City, Utah.

The four units changing to **aeromedical transports** are the **137th,** White Plains, N. Y.; **156th,** Charlotte, N. C.; **167th,** Martinsburg, W. Va.; and the **187th,** Cheyenne, Wyo.

Of the nine units above, five have been in air defense, flying **F-86Ls,** two in tactical fighters using **F-86Hs,** and two in tactical reconnaissance employing **RF-84Fs.** All will go to **MATS as gaining command.**

ADC also **loses the two squadrons** being assigned North American **F-100Cs** and one which goes into **Martin RB-57s.** The new Supersabre tactical-fighter squadrons are the **120th,** Denver, Colo., and the **127th,** Wichita, Kan. **RB-57s** are going to the **192d,** Reno, Nev. All have been flying the **F-86L.**

Down and Out—Fast

A **realistic recovery exercise** is being arranged between the **Fifth Air Reserve Region** and the **Strategic Air Command** to take place at **Des Moines, Iowa,** probably within the next month. The exact date and hour are, of course, secret because **CONAC** wants to see how well the recovery squadron at Des Moines **can respond on short notice.**

The exercise will involve a **SAC B-52 jet bomber** and its **KC-135 tanker.** During a training flight over the Arctic the B-52 commander will **radio Des Moines** that the plane **intend to land** at the municipal airport there.

The **recovery squadron** thus will get about **three hours' notice** to assemble its **personnel and equipment** at the airport. It will be up to the squadron to **bring the planes in, service them, take care of the crews' immediate needs,** and **get the planes back into the air.**

(Continued on page 101)

The new Beechcraft L-23F . . .

Meeting the U. S. Army's requirement for a modern high-performance, low-cost transportation system

Already serving the U. S. Army, the versatile new Beechcraft L-23F is the latest in a long line of high-performance training and utility aircraft which Beech Aircraft Corporation has designed, developed and produced for the military services since 1932.

With supercharged fuel injection engines, the L-23F combines high altitude cruise power with exceptional short field performance, rugged durability and low operating costs to meet a wide range of needs . . . as a command liaison or personnel transport, a carrier of high-priority cargo, an aerial ambulance, or a multi-engine instrument trainer with a "big plane" feel. Designed and engineered for future pressurization and turbo-prop modification.

Beech Aerospace Division

BEECH AIRCRAFT CORPORATION • WICHITA 1, KANSAS.

Beech Aerospace Division projects include R&D on manned aircraft; missile target and reconnaissance systems; complete missile systems; electronic guidance systems; programs pertaining to liquid hydrogen propellants and cryogenic tankage systems; environmental testing of missile systems and components; and GSE. May we help you? Write, wire, or phone Contract Administrator, Beech Aircraft Corp., Wichita 1, Kansas—or nearest Area Office.

COMPUTENCE... TOTAL COMPETENCE IN COMPUTATION

. . . provides effectiveness for new system of mobile defense against multiple airborne targets

The program: MAULER, U.S. Army's newest automatic-firing air defense system, involving missile-firing vehicles transported by air and parachuted into battle areas. **Basic Burroughs contribution:** design and production of the miniaturized electronic computer systems which will provide radar data processing and computation for MAULER. Among special design features will be the Burroughs Logi-Mod packaging technique, to protect sensitive computer components from shock during air transport and parachute drop. **Behind the news:** Still another vote of confidence in Burroughs Corporation's Computence—total competence in computation—from basic research through production and field service to system management. Confidence in Burroughs performance, already proved in such vital programs as ATLAS, SAGE and ALRI.

Burroughs—TM

Mauler is being developed by Convair-Pomona, Convair Division of General Dynamics, for ARGMA, an element of the Army Ordnance Missile Command.

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The first radio program taped in the new studio of USAF's Chicago Office of Information explored today's role of the Air Reserve and Air Guard. The program was aired New Year's Eve over WBBM, Chicago's CBS outlet. Taking part were, from left, Brig. Gen. J. Lafeton Whitney, USAF (Ret.), Commander of the Military Order of the World Wars; Brig. Gen. Howard T. Markey, Commander, 126th A-D Wing and AFA Board Chairman; Hugh Hill, Chicago radio and TV personality; and Claude Sowle, law professor at Northwestern University.

In announcing the test exercise, **Maj. Gen. Harold Maddux**, until recently Fifth Region Commander *(see above)*, told reporters that there are **at least 400 commercial airfields** in the US that **can handle SAC jet bombers** and tankers. To man them all with active Air Force personnel would be **impossible without greatly increasing the size and budget of the Air Force.** But, he explained, the job **can be handled by Air Force Reservists.**

Some recovery units **have already conducted simulated tests**, but the Des Moines exercise will be the **first to be scheduled between CONAC and an Air Force combat command.** As recovery squadrons become operational, others will follow to test the **ability and readiness of recovery squadrons** to meet their vital responsibilities toward USAF combat crews.

Recognition for a Hero

A1C James J. Pennington of the **121st Tactical Fighter Squadron**, D. C. Air National Guard, is the first member of the Air Reserve Forces to win the **USAF Airman's Medal.**

The Airman's Medal was **established last summer** as the Air Force's **counterpart to the Soldier's Medal.**

Airman Pennington was cited for his **brave and swift action last September** in combating an **explosion and fire in an F-86H** on the Air Guard ramp at Andrews AFB.

Pennington had been standing on the wing, helping to strap in **Maj. Robert J. Pasqualicchio**, the squadron air adviser, before a flight. When Major Pasqualicchio hit the **starter button** there was an **explosion** which knocked Pennington to the concrete. After being stunned momentarily, Pennington checked to make sure the pilot could get out, then grabbed a **fire extinguisher to fight the blaze** while other crewmen hurriedly **removed aircraft** that were parked nearby.

The **F-86H** was a **total loss**, but Airman Pennington's **courageous action** in battling the fire at close quarters despite **danger of further explosions** prevented the blaze from spreading to other aircraft.

Last But Not Least

The **Air Guard commanders' conference** has been scheduled for **Ellington AFB, Tex., April 18-20.** . . . To reflect its new space mission, the **Reserve's 434th Wing** at Bakalar AFB, Ind., is reportedly being **redesignated the 434th Aerospace Troop Carrier and Capsule Recovery Wing.** Its three squadrons—the **71st and 72d** at Bakalar and the **73d** at Scott—are to share the new title. . . . **CONAC** is considering assigning **each of its new C-124 squadrons twelve instead of eight** aircraft. . . . The agenda planning group for the **Air Reserve Forces Policy Committee** will meet in the Pentagon **February 6.** The full committee is expected to meet in late March or early April, beginning with an **orientation visit to Cape Canaveral and TAC Headquarters.** . . . **Ray Higgins**, who has logged almost ten years as **Air Guard personnel chief** during two tours in the Pentagon, **retired** in his ROPA bird colonel grade December 31 after twenty-five years' service. But he was **back on the job** January 3 in civil-service status. . . . The **Dallas, Tex., AFA Squadron**, led by **Maj. Jim Rose**, is joining with the **Dallas JCC** and the **Texas Air Guard's 136th Wing** in planning a **major air show** in mid-August to dedicate the Guard's new hangar at Hensley Field. . . . **Air Weather Service hopes** to recall up to **200 Reserve weather officers** this year—company grade only. . . . **Air Guardsmen** have **donated $100,000** to the **Air Force Academy** stadium fund drive. In a few states, **Army Guardsmen** also chipped in. . . . **Brig. Gen. Phil Ardery**, former Kentucky Air Guardsman now a mobilization assignee at Hq. USAF, would be **Brig. Gen. Jimmy Stewart's** "boss" in the Office of Information. Ardery is **Maj. Gen. Arno Luehman's** replacement as info chief; Stewart would succeed **Brig. Gen. Ben LeBailly** as deputy chief.—END

Former President Harry S. Truman, left, acts as host at the Truman Library, Independence, Mo., to a two-day showing of the nose cone of Discover XIV. Thousands from Kansas City saw the forty-pound nose cone. The project was sponsored by the Air Force Reserve. Also shown from left are Col. Richard C. Gibson, AF Academy instructor; Col. Rufus Burrus, USAR (Ret.); and Lt. Col. John A. Riffle, liaison officer in Kansas City Air Reserve Center.

TECH TALK

J. S. BUTZ, JR.

The long-awaited design competition for a new, **high-subsonic speed transport** to modernize **Military Air Transport Service** officially began in late December. The **Air Research and Development Command** on December 22 issued to industry a request for proposals to meet **SOR-182,** calling for an aircraft which can carry **70,000 pounds over short distances, 50,000 pounds nonstop over the Atlantic,** and **20,000 pounds nonstop over the Pacific.** The company proposals are due at **Wright Air Development Division** by January 27. ARDC is scheduled to make a source selection by the middle of March. This recommendation will be returned to the **Weapons Board.** It is planned that a winner will be announced and a contract signed by **May 1.**

The **Federal Aviation Agency** has participated in the laying down of **specifications** for this aircraft. Hopefully, it will justify predictions and prove economical enough to **open a new era of greatly increased air-freight business and lower freight rates** for the civil airlines.

Engine and airframe manufacturers have been **working hard for more than a year** on preliminary design proposals to meet the MATS requirement, which seems to represent one of the few **opportunities** in the next decade or more for **large-scale production of heavy aircraft and power plants.** The contractors most active during this time have been **Boeing, Lockheed, Douglas, Convair, Pratt & Whitney,** and **General Electric.**

It is probable, judging from opinions expressed at technical meetings, that the new MATS transport will have a **high wing, a high tail with truckbed-height loading** straight in from the rear of the fuselage, and **four turbofan engines.**

* * *

An **optical signaling system,** or signal light, able to transmit **messages in space** over distances up to **ten million miles,** has been successfully tested at **Edwards AFB, Calif.** The prototype system was constructed by **Electro-Optical Systems, Inc.,** under a contract from **ARDC's Wright Air Development Division.** During the tests of the solar, optical communications system (**SOCOM**) the **message-carrying light beams** were purposely attenuated to simulate distances in space from 10,000 to 10,000,000 miles. As a result of the tests it is believed that the **ultimate range** of SOCOM will be **considerably greater.** Weight of the system in its final flight configuration is estimated to be **thirty to forty pounds.**

The SOCOM transmitter operates by **collecting solar radiation** with a large mirror, then funneling it through a **modulator** for coding, and finally to a **transmitting mirror.** The **receiving unit** has a mirror to **collect the signal beam** and focus it for **transmission to a detector unit** which **interprets it and reads it out** in usable form. The signal beam carries for great distance primarily because of its **highly directional nature** and the **high intensity of the light** from the solar source. At maximum range about **ten message bits can be transmitted each second.** This sending rate increases rapidly as the range shortens.

* * *

A good fix on the errors to be expected from **operational altimeter installations** has been obtained by the **National Aeronautics and Space Administration** in tests made with **196 military and civil aircraft** during more than **400 landings.** The tests showed that the **average military pilot** can expect his altimeter to be in error **forty-three feet** in either direction during **fifty percent of his landings.** In three landings out of 1,000 his altimeter will be off by **189 feet in either direction.**

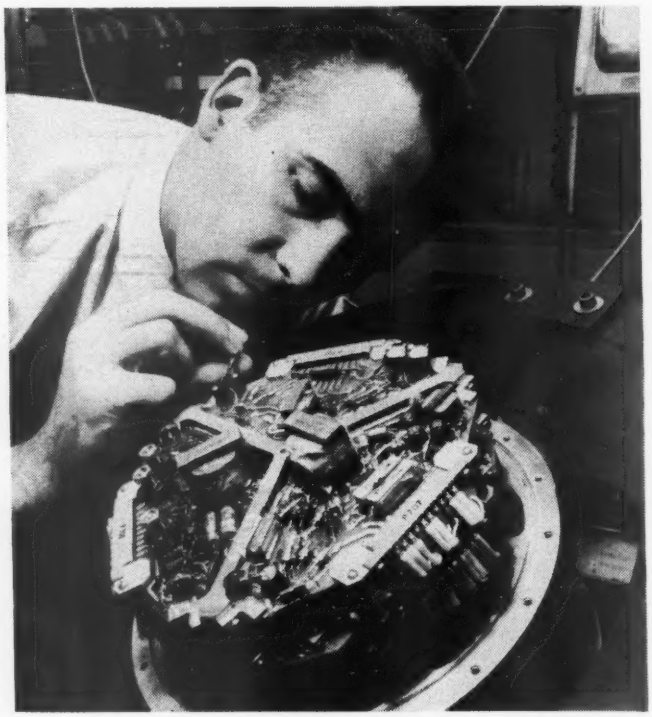
Altimeter readings in **scheduled airliners** proved to **be more accurate** than those in military equipment. Errors for the civil transports were **plus or minus twenty-two feet** in fifty percent of landings. In three cases out of 1,000 they will be **plus or minus ninety-nine feet.** Errors in altimeter readings stem from **three primary causes:** the **instrument** itself, its **installation** in the aircraft, and **maintenance** care. The NASA tests point up the task of the military, civil operators, and equipment manufacturers in **improving the accuracy of altimeter readings** during landings. The level of accuracy is considered to be barely **adequate** by some.

Further tests are planned to obtain **altimeter error information at high altitudes.** Very accurate **ground** radar will be used to **check the instruments.** During the **recent NASA tests cameras** were used to make the check.

* * *

Early predictions of high performance for **thermoelectric power units** are beginning to be substantiated by **experimental data** after a couple of years of **disappointing work,** according to a recent report by the **Naval Research Laboratory.** However, the good news seems to be **falling on deaf ears** in the military agencies responsible for the development of vehicles and power

(Continued on page 105)



Size of strapped-down inertial-guidance systems is steadily decreasing. Minneapolis-Honeywell unit, right, with three 14-oz. gyros, was used by NASA to launch Tiros II weather satellite.

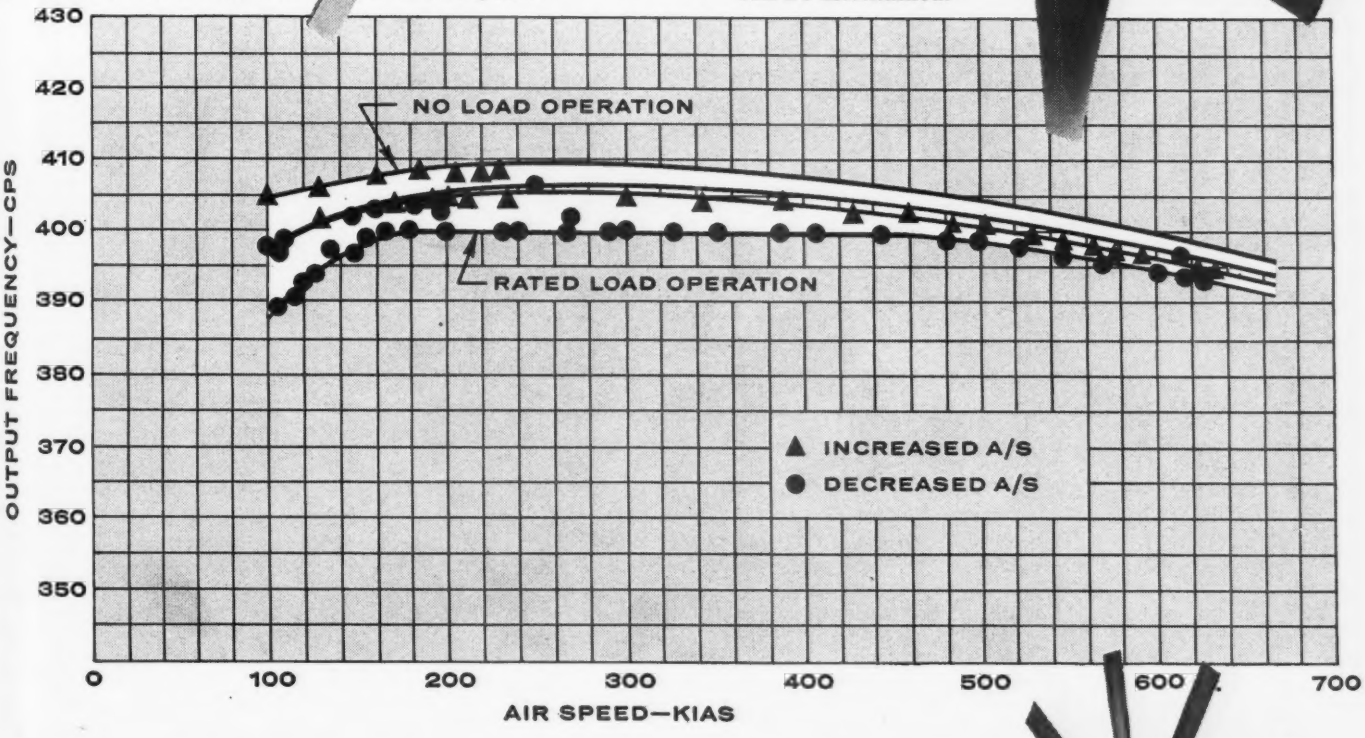
AiResearch ram air turbines unequalled in reliability and fine speed control

Electrical ram air turbine

In-flight hydraulic and electrical power for aircraft emergency use and airborne pods is supplied by AiResearch ram air turbines ranging in size from fractional to 100 horsepower. The fine speed control regulates the turbine to ± 5 per cent from aircraft design speed to above Mach 1. For special electrical applications frequency control lower than ± 5 per cent can be maintained.

Hydraulic ram air turbine

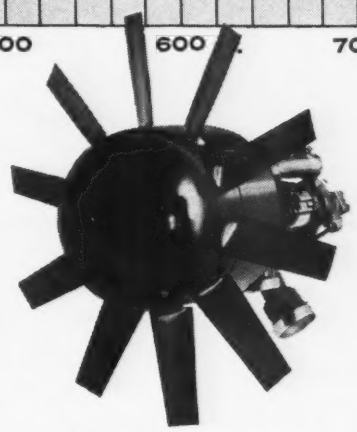
Fine speed control of 2.5 KVA ram air turbine system



As an emergency power source, the ram air turbine provides sufficient hydraulic power, electrical power or a combination of both for operation of the aircraft's basic controls in the event of main engine failure.

Ram air turbines also serve as auxiliary power supply systems, particularly in remote locations where independent power supplies offer optimized design. For example, they supply continuous electrical power to operate electronic equipment within aircraft-carried pods. Other areas of ram air turbine application include high speed drones and STOL aircraft.

AiResearch produced the first successful ram air turbine and has delivered more than 6000 units in 20 model types — more units than any other company. This knowledge and experience not only contribute to the reliability and high performance characteristics of AiResearch ram air turbines but also enable the company to produce newly designed units in the shortest possible time.



Hydraulic ram air turbine

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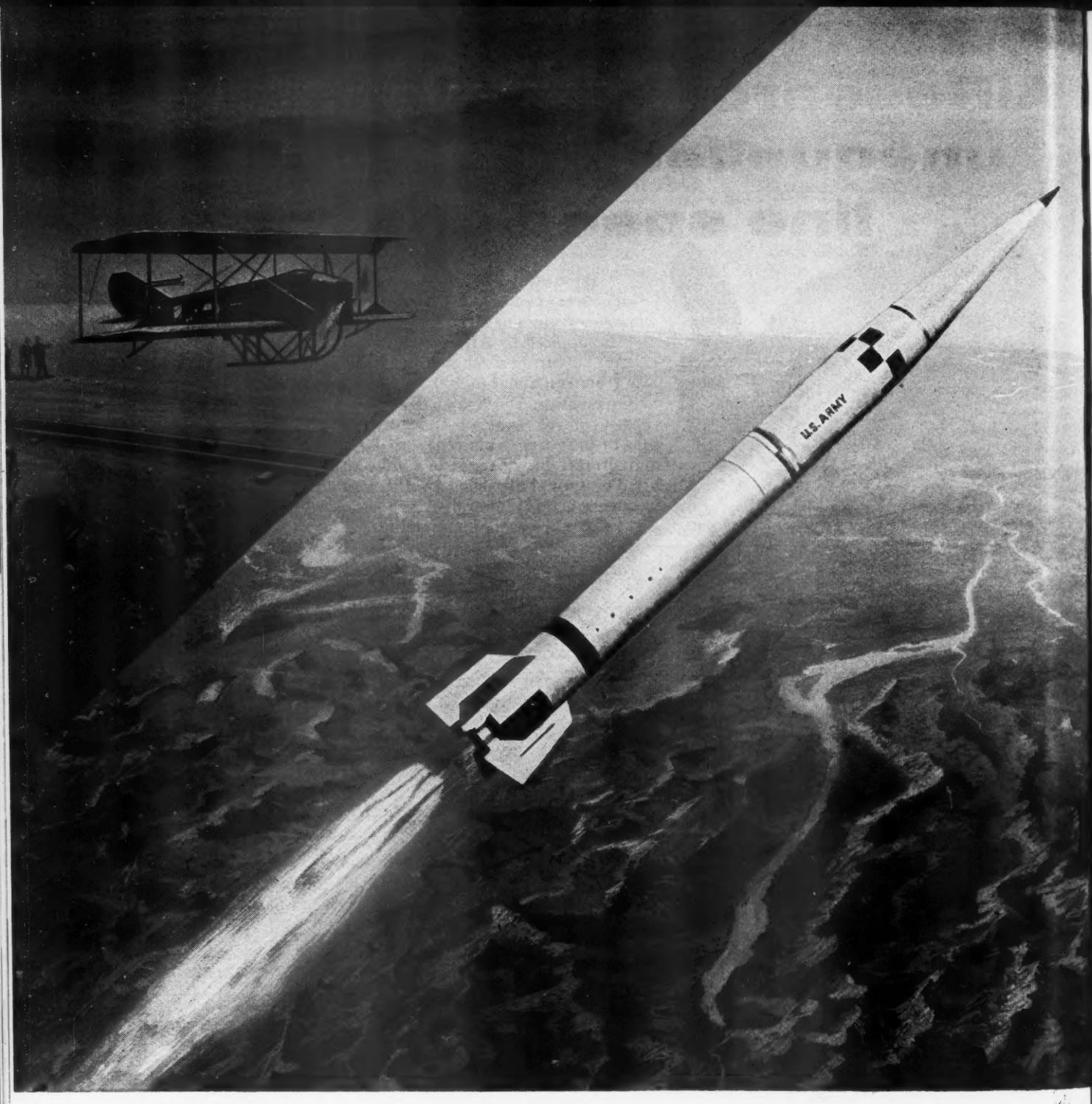

Missilry: 45 years ago, and today

There was a guided missile nearly a *half-century* ago. It was Sperry's Aerial Torpedo for the Navy—the world's first guided missile, 14 feet in length, and with a range of 50 miles at 90 mph.

Since then, a family of missiles and of missile guidance systems of ever-increasing power—and "brainpower"—has evolved at Sperry. Notable was the Navy's Sparrow I, the first operational air-to-air missile. An outstanding example today—when it becomes operational—will be the Army's Sergeant, for which Sperry is prime contractor. A medium range, surface-to-surface, inertially-guided ballistic missile, Sergeant has had a brilliant record of successful test firings. It is highly mobile and easy to operate—approaching conventional artillery in speed of emplacement and displacement.

In systems and components for missiles, too, Sperry has made major contributions. For the Army's Nike Zeus – the nation's only anti-missile missile system now in the advanced development stage for intercepting ICBMs—Sperry developed for Bell Laboratories and Western Electric extended range target tracking and discrimination radar transmitters. Other Sperry radar systems acquire, track and guide the Navy's Terrier and Talos missiles, providing precision fire control for missile cruisers, destroyers and carriers.

Sperry's role in missilry is another example of the Company's integrated capabilities—capabilities that are contributing importantly today in every major theater of our environment. General Offices: Great Neck, N. Y.

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equipment. Originally, these agencies were enthusiastic about the possibility of **wide use of thermoelectric generators,** which would have **no moving parts** and would develop an **electrical potential simply by being heated unevenly.** But this **enthusiasm dimmed** as experimental problems accumulated. As a result many of the **supporting research programs** necessary to the quantity production of these units **never were authorized.**

The necessary support programs cover such problems as **development of light connections** with minimum electrical resistance, which fix the size and weight of a thermoelectric generator, and the **composition of long life doping agents** for the connections, which determine the operational life of the system.

The **scientists** working in this area, who now have experimental proof that their **efficiency estimates are good,** must try to sell practical applications **without the data necessary to ensure trouble-free production** and long life. Some of the applications which now look possible to the NRL researchers primarily as a result of **proprietary industry work** are: **nuclear-thermoelectric generators** in which the thermocouple material is placed in the reactor core rather than around its periphery, which will cut unit size considerably; **flat layouts of thermocouples** for use in space which will be **lighter and cheaper** than solar cell arrays even though they will occupy more volume. It is also believed at NRL that ship propulsion is **much closer to reality** than it has been in the past although there is still **much left to be done** before this can be proved experimentally.

If it proves possible to propel a sizable ship through the use of a **nuclear reactor and thermocouples,** then virtually all vehicles should be **eventually adaptable to propulsion by nuclear power.** The very small reactors which would be required by **automobiles and other land vehicles** already have their **prototypes** in units constructed under the **SNAP program** managed by the **Aircraft Nuclear Propulsion Office** of the **Atomic Energy Commission.** The availability of **large power sources** which have no moving parts and can operate for extended periods in remote areas will also improve the chances for construction of **elaborate unmanned beacon, surveillance, and attack networks** under water and in space.

The optimistic NRL report may serve to renew the interest of many **Navy and Air Force agencies** which have eliminated plans to use all but **very low-power thermoelectric generators.**

* * *

Development of effective **lightweight radiation shields** for manned spacecraft is currently **receiving major efforts** in the US airframe industry. The main handicap in this work is that the **radiation environment** is not completely understood either **near the earth** or at distances as far out as **the moon.** Complete information won't be available **for several years.**

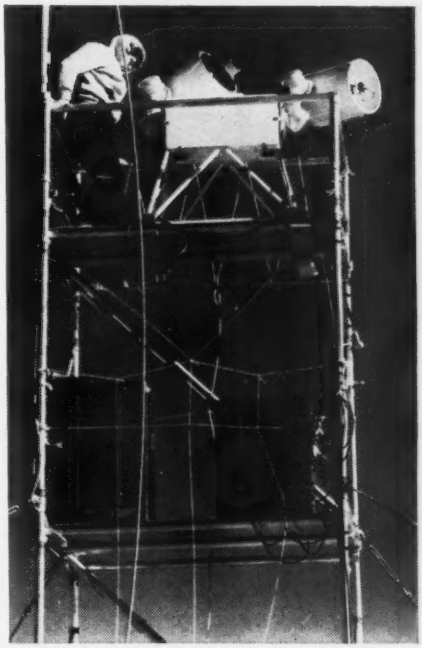
The present shield development work deals primarily with **basic approaches** to the problem and involves a **wide variety of possible solutions** to cover as **many radiation conditions** as appear to be possible. In general terms, there are **three basic radiation** zones near the earth. The first is above the atmosphere **from about 100,000 feet to approximately 300 miles,** where man apparently will be safe from overexposure to radiation, especially during short flights of the Project Mercury type. The second is in the **two Van Allen radiation belts** in which most experts now believe that man should not travel without shielding. The third area is **beyond the Van Allen belts to the moon.** The background radiation level in this area is **not known.** Present here is the added hazard of being completely **exposed to the heavy radiation storms** which occur during **solar flares.**

The spacecraft shielding ideas being studied to protect humans in all of these areas include:

- Use of **dense metals** with very high molecular weights in the spacecraft structure to shield against **electrons and light particles.** It appears possible to **save a great deal of weight** if the shield and vehicle structure can be at least partially integrated.
- Use of **water, fuel, or other materials** containing **hydrogen** to protect Astronauts from **heavy particle radiation.** For instance, plans have been considered for a crew to **submerge themselves** in their drinking water during solar-flare radiation.
- It also appears possible to use **metal hydrides** in the structure to protect against **heavy particles.**
- **Electric fields** have also been considered to **deflect certain types of radiation** past a space vehicle.

* * *

Two **direct-cycle nuclear turbojets** were recently started by **General Electric** and brought up to operating speed on **nuclear power alone.** Normally, **chemical fuels** have been used in the start-up of nuclear engines during testing.—END



Desert tests of the experimental SOCOM, optical signaling device, show it can be used in space over distances as great as 10 million miles. System was developed for the Wright Air Development Division by Electro-Optical.

Several lightweight safety suits for rocket-fuel handlers have been developed under Air Force contracts. These suits, weighing from 25 to 30 lbs. with a two-hour supply of liquid air for breathing and air-conditioning purposes are fireproof, moisture proof, and airtight to protect against the inhalation of poisonous chemicals. Adaptations of these suits are being studied to allow relatively unrestricted movement on the moon for a few hours.

AFA NEWS

SQUADRON OF THE MONTH

Miami, Fla., Squadron, Cited for

outstanding initiative and planning in staging the Space-Age Conference at Cape Canaveral, thereby bringing to the public an awareness of the importance of the activity centered there.

Many AFA units are planning programs to commemorate **AFA's fifteenth anniversary** this year. **Pittsburgh Squadron** and **Arnold Air Society Area B** are jointly sponsoring such a program on the week end of March 4 and 5 at the Penn-Sheraton Hotel, **Pittsburgh.** It will feature an **Aerospace Education Seminar,** discussed further below, and a banquet.

The **Beaver Valley, Pa., Squadron** has come up with an interesting anniversary event. The fifteenth anniversary **symbol is crystal.** So the unit will sponsor a **"Crystal Ball"** on February 4 in Ambridge, Pa. To boot, **three new members who have birthdays** on the same day, February 4, will be inducted into the Squadron that evening.

In **New York City,** leaders of the Wing marked the anniversary with a **gathering honoring Julian B. Rosenthal,** who served as **AFA Secretary** for twelve years and **Chairman of the Board** last year. He was one of the **original thirteen individuals** who met to form AFA in 1945. A reception was held at New York's **"21 Club"** for Julian on January 27. In New York, honoring Rosenthal is the same as honoring AFA. To many members there he is **"Mr. AFA."**

In connection with the fifteenth anniversary, **President Tom Stack** has stated that although the **anniversary date is February 4,** "The fact that an **anniversary program is held,** is much **more important** than that it be held on the exact anniversary date." Please let us know if your unit plans an anniversary program, and if so whether or not National Headquarters can lend any assistance.

Aerospace Education is occupying a more and more **important role** in **AFA Squadron programing** around the country. Latest word on this effort comes from the **Twin Falls, Idaho,** area. The **Magic Valley Squadron,** under **Commander Warren Murphy,** scheduled a program for January 20. Featured speakers on the program

(Continued on page 111)

George Kelley, Jackson Flowers, Edward Barber, and Martin Kirkland, planners of the Miami Squadron Space Age Conference, go over last-minute details before the show. Named Squadron of the Month for this fine effort, the group was host to more than 250 leaders from throughout the state during the one-day conference at Cape Canaveral. General Barber, USAF (Ret.), is Squadron Commander.

At October Northeastern Regional CAP Conference, New Jersey Wing Commander, Enrico Carnicelli, left, is shown with Brig. Gen. Stephen McElroy, CAP National Commander; Col. Nanette Spears, New Jersey Commander; Col. Roscoe Turner, guest speaker; and Col. S. J. Simon, CAP Regional Commander. Event was held at the Hotel Traymore in Newark, and attracted CAP members from the entire area.

"Miss Ogden" (Lois Carpenter), an employee at the base, and Col. E. J. Borowski join in cutting the Hill AFB anniversary cake ***(see page 111).***

IN COMMUNICATIONS... THE SIMPLER THE BETTER

New Hallicrafters all-modular SSB strip receiver cuts costs, increases reliability.

- **50% less maintenance**
- **Far greater stability and reliability**
- **Down time almost entirely eliminated**
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Hallicrafters' new SX-116 SSB Receiver is the essence of simplicity—key to reliability in the Hallicrafters Series 116 communication system.

The SX-116 is entirely modular in construction, *virtually eliminating "down time" and cutting maintenance cost by over 50%.* The unit is quickly and easily adaptable to existing systems, entirely compatible with future requirements.

It is extremely stable—1 part in 10^6 per month (standard) or 1 part in 10^8 per month (special) . . . it permits, for the first time, continuous, unattended operation with *maximum reliability.*

The SX-116 weighs in at just 36 lbs.—equally practical for fixed, mobile, air or seaborne installations. *And its initial cost is very substantially lower.*

Finding a better and simpler solution to complex communications problems has been a Hallicrafters habit for over a quarter-century.

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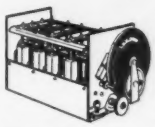
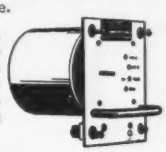
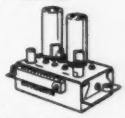


RF Module. Image and IF rejection maintained at better than 70 db. Single tuned circuit between antenna and RF grid. Four-channel, continuous tuning—2.0 mc. to 30 mc. range.

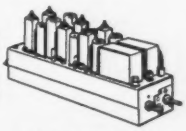
HF Crystal Oscillator Module. Stability: 1 in 10^8 per month. Capacity is four crystals; designed for HC-6/U metal or glass crystal holders. Oven temp. varies less than ±0.01°C.





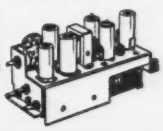
Injection Amplifier Module. AGC-controlled wide-band video amplifier provides constant injection level.

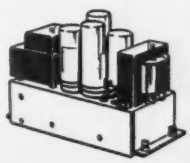
IF Module. Allows simultaneous reception of upper and lower sideband, independent AGC control of upper and lower sideband.



BFO Module. Operates at 1650.000 kc. Oscillator frequency stabilized in separate oven. Plate and filament voltages regulated.

Audio Amplifier Module. Features duel, independent 100-milliwatt line amplifiers. Hum level is 80 db. below 100 milliwatts. Harmonic dist. less than 0.5%.





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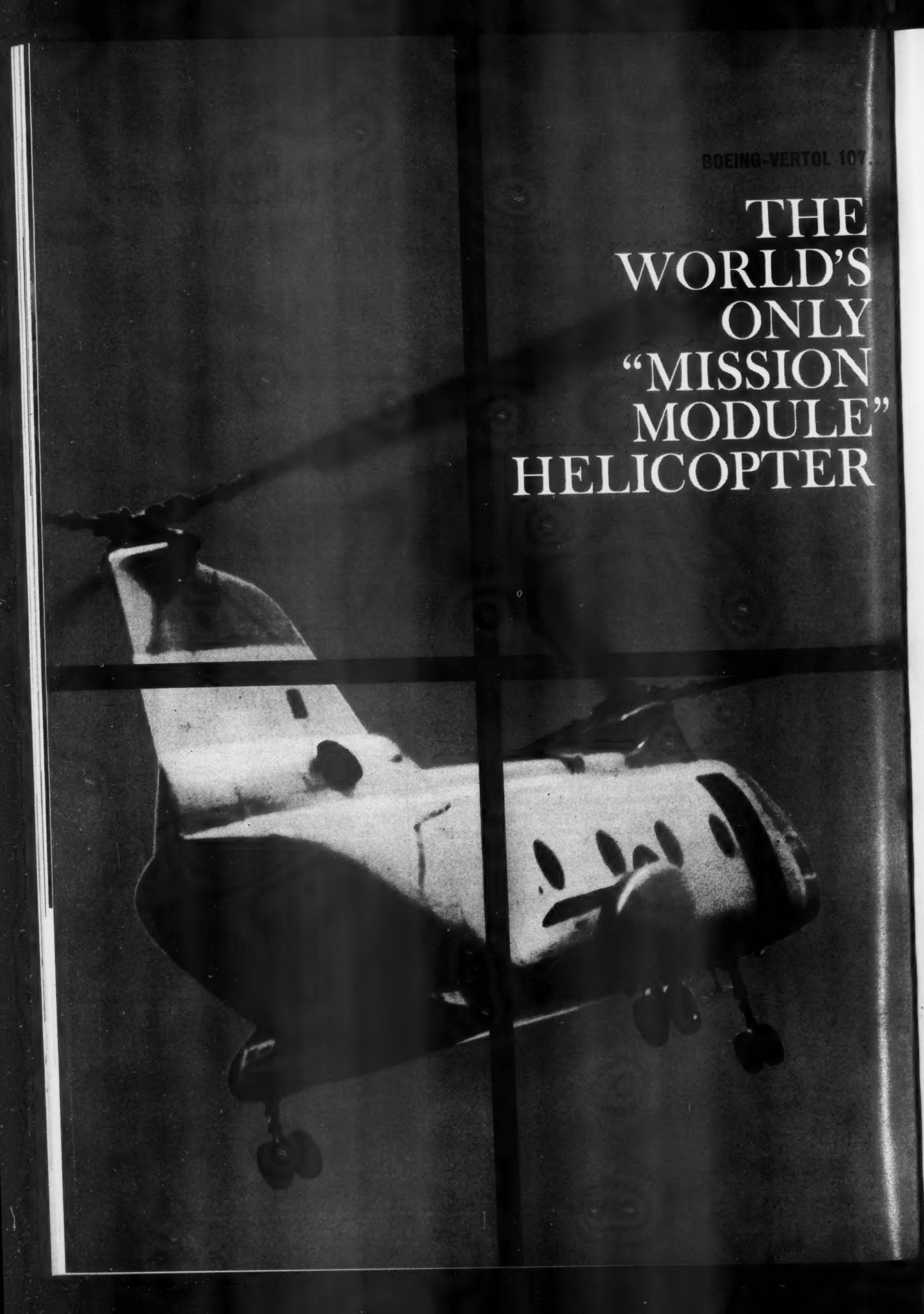
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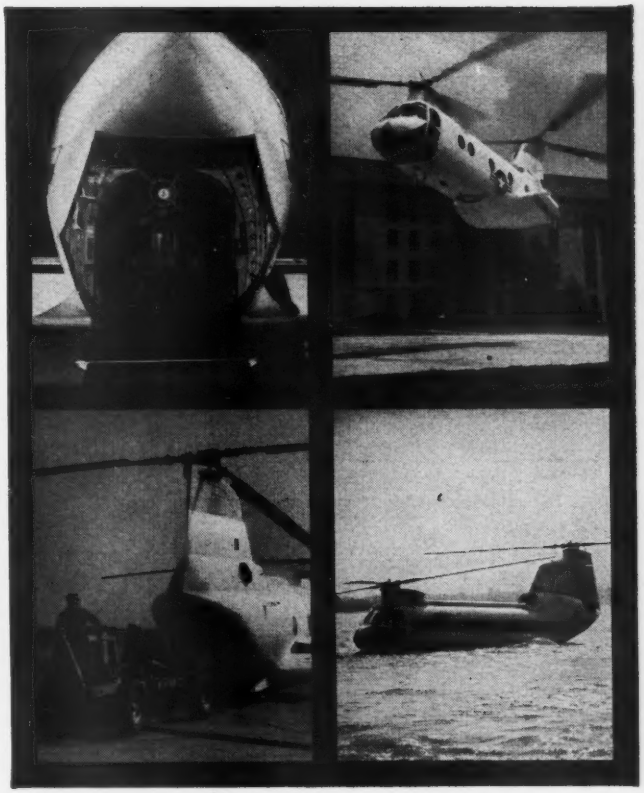
For the Air Force alone, the Boeing-Vertol 107 can perform search and rescue, security patrol, photo mapping and drone recovery. And in missile site support, the 107's twin-turbine speed, its tandem-rotor stability and all-weather, all-terrain capabilities assure around-the-clock delivery of payloads ranging from personnel to a cargo load of 5000 pounds or more carried internally, externally or even half-in, half-out.

These features demonstrate the all-mission, all-service capabilities of the Boeing-Vertol 107... the logical, versatile addition to today's fast-striking Army, Navy, Air Force and Marines.



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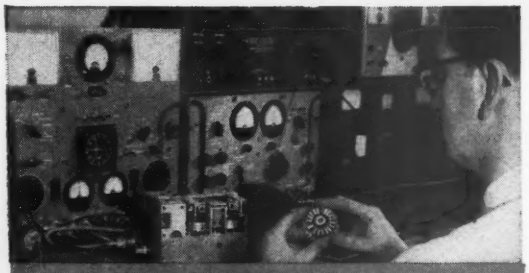

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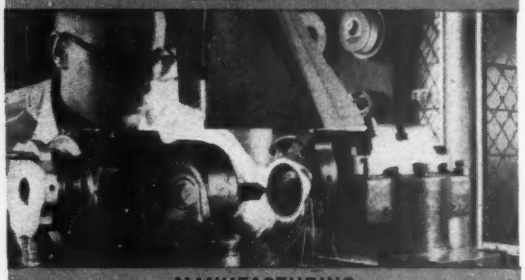

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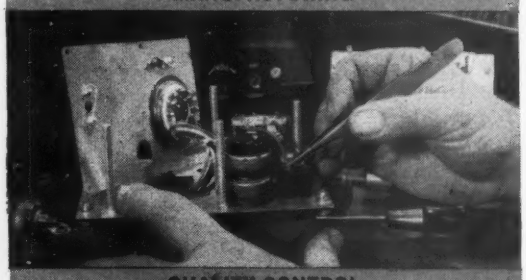

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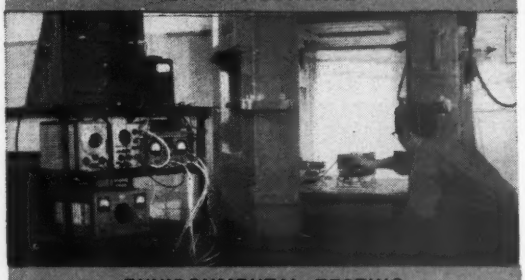

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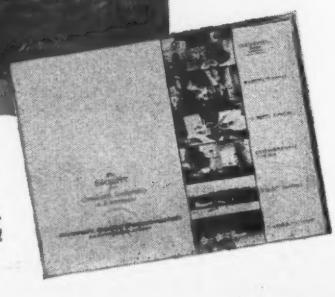

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Meeting recently to discuss plans to revitalize their unit, the Oklahoma City Squadron, were the three top officers of the group. Left to right, at the session: Matthew L. Lewis, Secretary-Treasurer; Jack Ericsson, Commander; and Elston Johnson, who is the Deputy Commander.

John Anderson, Logan Squadron Commander; retired MSgt. F. J. Waters; MSgt. Joseph Parker, recipient of the 1961 Waters Trophy *(see text)*; Brig. Gen. Charles Sweeney, 102d Tactical Fighter Wing Commander; and Col. John Stefanik, CO of the 104th Tactical Fighter Group, are shown above.

included **Miss Nan Glennon,** Space Technology Laboratories, and **Dr. Calvin H. Reed,** professor at the University of Nevada in Reno. Dr. Reed is also a **member of AFA's Aerospace Education Council.** The Idaho program is being cosponsored with the **CAP and the Twin Falls school system.**

At least part of the credit for the increased programing in the education field is to be given the **series of educational programs** held during **AFA National Conventions** under the leadership of the **Aerospace Education Council.**

AFA units lately have been **collaborating with Arnold Air Society units** around the country to sponsor **Aerospace Education Seminars** such as the one at **Pittsburgh** early next month. This program, initiated at AFA Headquarters, is currently scheduled for presentation at **six other locations: Columbia and St. Louis, Mo.; Boston, Mass.; Ogden, Utah; Las Vegas, Nev.; and Detroit, Mich.**

Utilizing the appearances of a **special briefing team from Air University,** these programs will begin on **February 4** (Columbia), and continue through **April** (Las Vegas). In each case AFA, AAS, and the respective state's Department of Education will cosponsor the event. Response to seminar ideas to date have been exceedingly encouraging.

* * *

The annual **Utah Wing Symposium,** scheduled for **February 17 and 18,** derives its funds for **sponsorship in part from a community dance** that is held several weeks prior to the occasion. This year the dance also focused attention on the **twentieth anniversary of Hill AFB,** the state's largest single employer.

Officials and guests of the recent "Meet Your Air Force" program held by the Beaver Valley Squadron ("AFA News," January '61) are shown above. Ed Gagliardia, fourth from left in photo, served as the General Chairman of program.

A Wing committee headed by **Ray Yates** proudly announced, at the conclusion of this year's Ball, that all objectives had been successfully attained. Everyone present agreed that a good time was had by all.

Joe Jacobs, Utah Wing Commander, and **Symposium General Chairman Robert P. Stewart** have extended an invitation to the Symposium to **all AFA members in the area.**

Miss Lois Carpenter, "Miss Ogden" and an employee at Hill, helped to **slice the anniversary cake** *(see cut, page 106)*, and generally served as the "frosting" for the program.

* * *

New officers have been elected by the **Arnold Air Society Alumni Division** of AFA. This active group is composed of former members of AFA's junior affiliate. Chosen President of the Division was **Lt. William Simon, III. Lt. Wells E. Hunt, Jr.,** became Vice President, **Mrs. Hunt,** Secretary, and **Lt. Lawrence R. Cotter,** Treasurer.

Simon is currently assigned to the **93d Air Refueling Squadron,** Castle AFB, Calif. Hunt is at **Little Rock AFB** (SAC). Cotter is stationed at **L. G. Hanscom Field,** Mass.

Immediate objective of the Division is an **expanded membership campaign.**

* * *

MSgt. Frederick J. Waters, one of the **first retired Air Guardsmen,** dates his service back to World War I. AFA's **Logan, Mass., Squadron,** recently named after him an annual trophy to be awarded to an **outstanding Air Guard NCO.** First winner is **MSgt. Joseph F. Parker,** a member of the Squadron and a veteran of **sixteen years' service.** Presentation *(see cut)* was made during a training week end at Barnes Airport, Westfield, Mass. **John F. Anderson,** a major in the Guard and Logan Squadron Commander, headed the awards committee.

—Gus Duda

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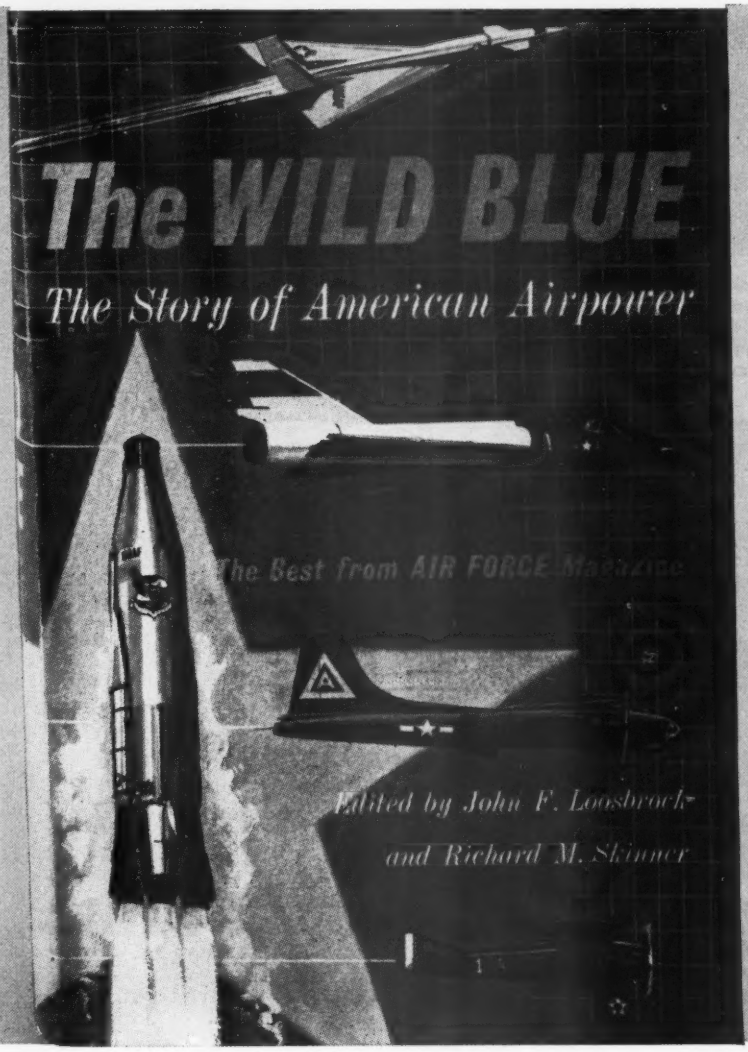
The WILD BLUE
The Story of American Airpower
The Best from AIR FORCE Magazine
Edited by John F. Loosbrock
and Richard M. Skinner

AIR FORCE MAGAZINE and SPACE DIGEST traces its history back to September 21, 1918, and the first issue of what was called the *Air Service Weekly News Letter*—four mimeographed pages. The *Letter* changed its name over the years (as did the Air Service) and blossomed forth in World War II as AIR FORCE Magazine, the official journal of the Army Air Forces. In 1946 it donned civilian clothes as the official publication of the Air Force Association.

***The Wild Blue* comes, then, from a forty-two-year accumulation of the best writing and thinking on American airpower. Not a history, it is packed with the stuff of which history is made. Covering the full sweep of the development of American airpower, the story begins on the windswept dunes at Kitty Hawk. It ends, if such a story can end, with the roar of giant rockets as US airmen penetrate the cosmic void.**

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The Best from AIR FORCE

***The Wild Blue*, edited by John F. Loosbrock, Editor, and Richard M. Skinner, Managing Editor, AIR FORCE/SPACE DIGEST (G. P. Putnam's Sons, New York, 1961, $5.95)**

Here, in advance of the book's publication, are excerpts from the Introduction to The Wild Blue, *a new anthology of the best from* Air Force *Magazine. The book is available to* Air Force/Space Digest *readers at the prepublication price of $4.95.*

° ° °

The biggest job the Editors of *The Wild Blue* had in preparing this book was picking the *best* from the accumulation of forty-two years of Air Force writing.

The process was a lot like what happens to the strongest of us on that day (preferably a rainy Saturday morning) we finally get around to cleaning out the basement or attic. We put on old clothes and at least the appearance of high resolve. Firm and unswerving, heedless of dust, we attack the back issues of our favorite magazine. We tie up maybe one or two bundles for the next Boy Scout scrap-paper collection, and then a well remembered cover catches our eye. We risk a moment's distraction to leaf through the yellowing pages. And then . . . well, we all know what happens to the rest of the morning.

The accumulation in Air Force Magazine's attic goes back to September 21, 1918, when the *Air Service Weekly News Letter* first appeared. There were a lot of words written between that time and mid-1960, some of them very good words, some less good. It took more than a few rainy Saturday mornings for us to pick out what we felt were the best, until we had what we believe is, indeed, the *best* from Air Force Magazine and its distinguished ancestors.

The Wild Blue is not a history, though it is packed with the raw stuff of which history is made. Covering the full sweep of the development of American airpower, the story begins on the windswept dunes at Kitty Hawk, N. C., when the Wrights first divorced man from "the surly bonds of earth." It ends with the roar of giant rockets as man pierces the envelope of atmosphere that separates him from the stars.

In between one reads of the early days of military air combat, when knightly foes engaged in single combat above the muddy trenches of the Western Front; of the never-ceasing struggle between the wars to fly ever faster, farther, higher; of the great events of World War II, when airpower came into its own and men fought and died in the skies over Germany, the South Pacific, China, the Hump, the Japanese home islands; of the early postwar days when jets took over, when weary airmen kept West Berlin alive as an island of freedom in a Red sea; then Korea, the first jet air war in history; the coming of the missiles and the hydrogen bomb; the cold war of deterrence waged to prevent the hot war from ever coming to pass.

In many cases the story is told in the words of the men who themselves made Air Force history—Billy Mitchell, Hap Arnold, George Kenney, Jimmy Doolittle, Tommy White, and Larry Kuter, among many others. In other cases the authors are top writers—Beirne Lay, Jr., MacKinlay Kantor, Milton Krims. And in still other cases the author may be simply "The McCook Field Correspondent."

But whoever the author—from Lt. Walter Barneby (who was killed in action before his "Letter from France," written in May 1918, reached his mother) to Brig. Gen. Charles H. Terhune, Jr. (who writes knowingly of the Air Force's role in the Space Age)—we have tried to make this book a sampler of Air Force life . . . and death; of achievement . . . and failure; of mission and dedication, all in the wild blue yonder.

The Enemy Was Human

***The Grave of the Twin Hills*, by Maj. Bowen Hosford, USAF (Norton, New York, 1960, 316 pp., $3.95)**

Reviewed by Capt. Frank W. Anderson, Jr., AFRes.

In June 1945 an American fighter plane with the nickname "Sitting Bull" was hit over Japan. The pilot crash-landed and was killed in an ensuing scuffle with local villagers. Afraid of the secret police because they had not reported the presence of the American pilot, the villagers buried the body on the hilltop. One old villager, who had talked with the pilot in the night before he was killed, erected a small monument of stones over his grave, thereby earning for himself the undying hatred of the guilty villagers. Ten years later, a small item in a base newspaper on this monument to a dead American flyer arouses the interest of a correspondent from the States, and he comes to the village to look at the grave.

This simple situation is the trigger of Maj. Bowen Hosford's novel, but it is only one part of the story and only one level of this compelling first novel. The author has also sensitively examined a delicate matter—the reaction of the individual when he finds his country allied with a previous enemy.

For the hero of *The Grave of the Twin Hills*, the search for the answer is what brings him back to Japan ten years after the war. A newspaper reporter on a small paper in Tennessee, Alton Burrage is not sure just why he has persuaded his editor to let him make the trip, with he himself paying a good part of his expenses. All he knows is that he has never quite been whole since he was wounded in a B-29 raid on Japan and woke in the hospital to be told that his twin brother was missing over Japan in another B-29.

His brother's plane was seen going down in flames. Four parachutes opened, but none of the flyers was seen again. Looking for this other part of himself, looking for confirmation of his hatred of the Japanese, and seeking means of punishing them for his loss, Burrage stumbles on the story of the hilltop grave of the American pilot. On his first trip to the site this appears to be a touching human-interest story—the unknown soldier buried by the compassionate enemy in the midst of war. Almost against his will he writes the story that way.

Then another and perhaps the most informative theme enters the picture. Burrage meets Amiko, a Japanese girl of good family who was a refugee in the village when the pilot crash-landed, who helped him hide, and was present at his death. Working at a drab job in a dress shop in Tokyo and teetering on the brink of prostitution, Amiko is stirred by the American newspaper man to remember that other American of the war years. Through flash backs we relive the wartime experiences in a Japanese village during the war—the abysmal fear of the "B hateful," as

(Continued on page 116)

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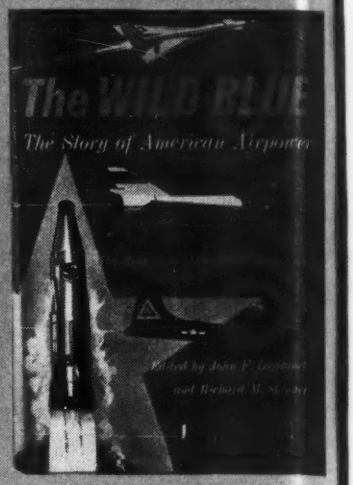

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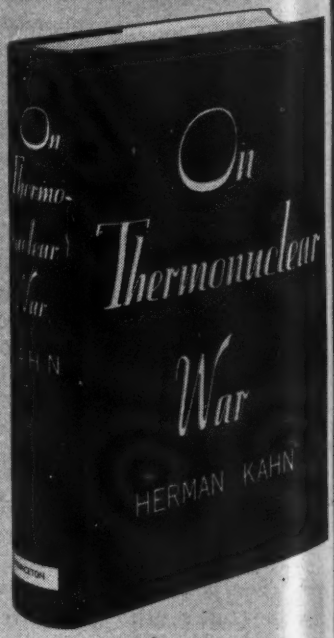

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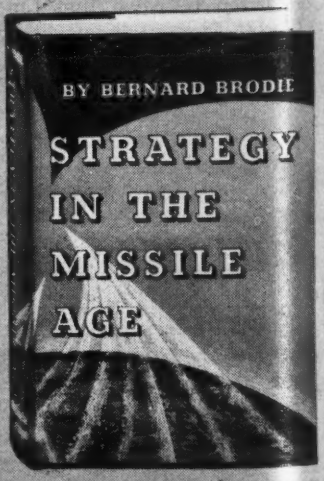

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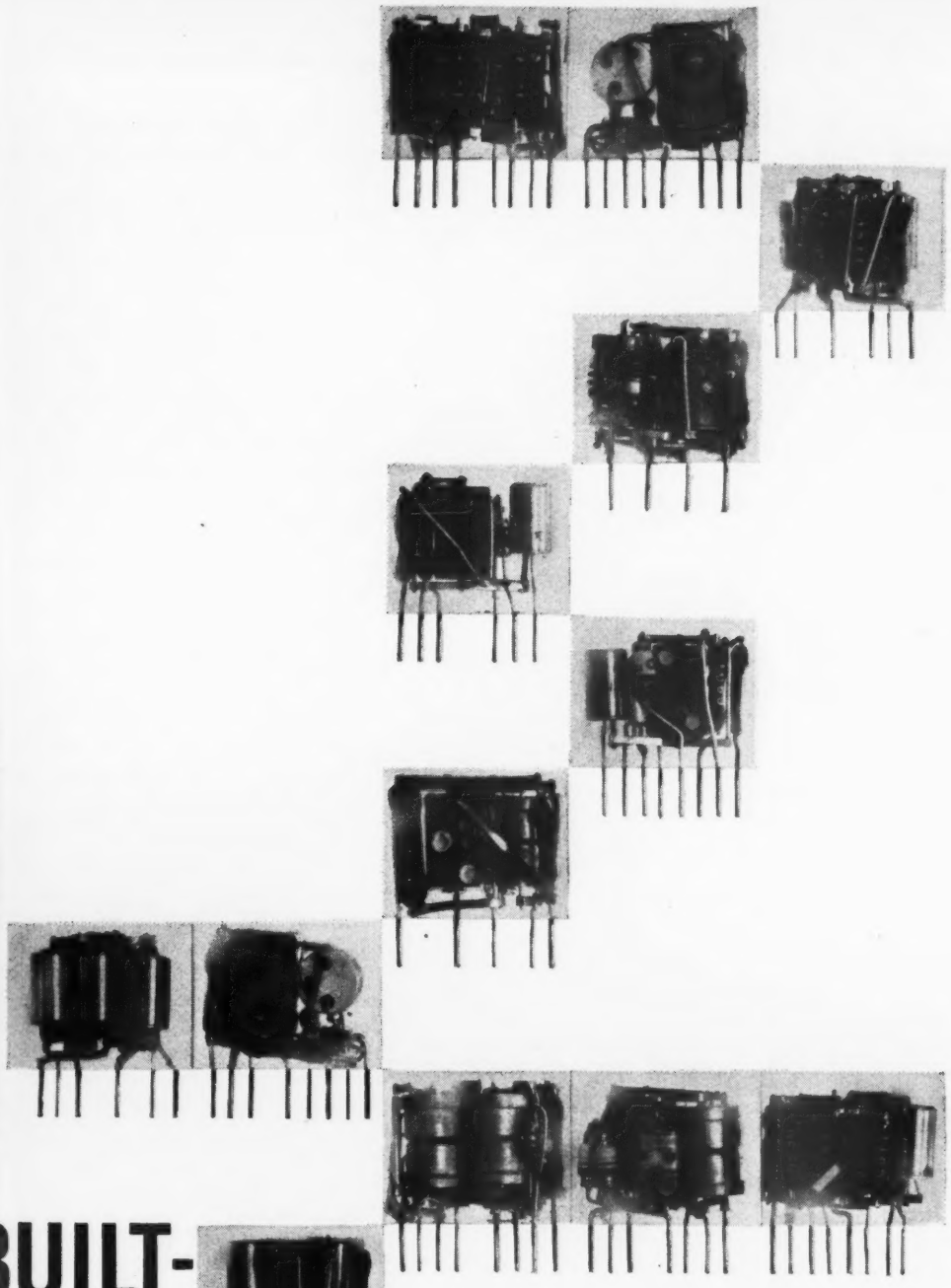

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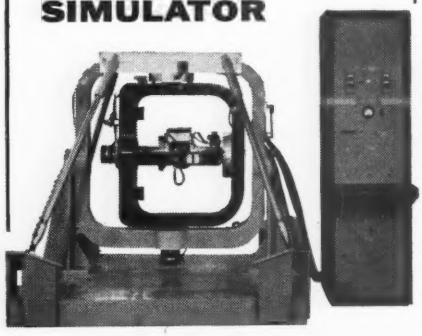

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the B-29s were called, the conviction among the villagers that the Fisheyes who flew in the hated bombers were all redheaded, blue-eyed monsters.

We, and Burrage, come to a partial understanding of this Japanese society. As Amiko and her friends gradually unfold to him the details of the story behind the grave on the hill, he vacillates between his bitter desire to punish the Japanese for what he considers to be one more war crime and his growing understanding of the human fears and ignorance that prompted their crime. And at the end he is not only posed this problem as an individual but as a representative of his country. To him, at the climax of a truly fine first novel, is largely left the decision of whether one more belated, black, and bitter incident will be dredged up to unhinge the growing accord and understanding between Japan and the United States.

About the reviewer: *Capt. Anderson is Managing Editor of the Air University* Quarterly Review.

No Such Animal

***Flying Saucers and the US Air Force*, by Lt. Col. Lawrence J. Tacker, USAF (Van Nostrand, Princeton, N. J., 1960, 164 pp., $3.50)**

Reviewed by Flint O. DuPre

Flying saucers? The Air Force is pretty well convinced, after an exhaustive study of the subject, that there ain't no such animal. A new book, Lt. Col. Lawrence J. Tacker's *Flying Saucers and the US Air Force,* presents this Air Force view with careful documentation and more than routine attention to the details of interesting "sightings."

Each UFO report from any source is investigated thoroughly by the Aerospace Technical Intelligence Center, Wright-Patterson AFB, Ohio. The findings, as Colonel Tacker tells us, are usually, "The object responsible for the sighting was a fireball," or, "No valid conclusion could be found from available information as to the possible cause of the sighting and it remains unexplained."

Colonel Tacker admits it is easy to be fooled into thinking you have seen a UFO. Unusual weather or light conditions may make many familiar objects appear strange. A meteor, comet, or balloon, even an aircraft under certain conditions, can assume an appearance which is not characteristic of the object normally. Aircraft at great heights can appear wingless and shaped like projectiles. These and other objects can appear as saucers to people who have saucers on their minds.

The book answers charges by avid saucer believers that the UFOs are real or are spaceships under intelligent control, and that the Air Force withholds vital information on this subject from the public. Page by documented page, it tells the businesslike story of Air Force studies in this area.

Further, USAF's Chief of Staff, Gen. Thomas D. White, states in the foreword, "All unidentified flying-object sightings are investigated in meticulous detail by Air Force personnel and qualified scientific consultants. So far, not a single bit of material evidence of the existence of spaceships has been found."

Colonel Tacker took this and other matters up in a recent nationwide TV debate with retired Marine Maj. Donald Keyhoe, who believes saucers are surveillance ships from outer space.

The Air Force began investigations in this field as early as 1947 and has intensified its work in recent years. Reported sightings in the last thirteen years total more than 6,500. The high mark was 1,178 sightings in 1957, with less than a third of that number reported for each of the last two years.

Flying Saucers and the US Air Force is illustrated with photographs and drawings of reported UFOs. It includes copies of regulations, news releases, and other official papers.

About the reviewer: *Mr. DuPre is an information specialist at Hq. USAF and a past contributor to* AIR FORCE.

NOTE: Any book reviewed in Airman's Bookshelf may be obtained, postpaid, from the AeroSpace Book Club, Mills Building, Washington 6, D. C. Full payment must accompany order. Information on the Book Club may be obtained from the same source. Club members are eligible for substantial savings on Club selections.

Sign of the Times

Issues of defense and world affairs are examined in a wide variety of current books.

Defense: Policy and Strategy, by Air Vice Marshal E. J. Kingston-McCloughry (Praeger, $6). Examines present defense strategy of the West. The theme is that western military leaders do not fully understand the implications of modern weaponry.

(Continued on page 119)

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Neither War Nor Peace: The Struggle for Power in the Post-War World, by Hugh Seton-Watson (Praeger, $7.50). A history of post-World War II international relations. Analyzes the problems of the cold war and studies great issues dividing East and West, totalitarianism and nationalism.

The Economics of Defense in the Nuclear Age, by Charles J. Hitch and Roland N. McKean (Harvard Univ. Press, $9.50). A study of nuclear military problems in relation to economic problems including utilization of resources. Emphasizes continuing revolution in defense technology, continuing reshaping of strategic forces in being.

National Security in the Nuclear Age: Basic Facts and Theories, edited by Gordon B. Turner and Richard E. Challenger (Praeger, paperback, $1.85, hard-cover, $6). Essays by seven authorities covering every national security problem confronting the US today; theories of warfare; deterrent strategy; implications of missiles; diplomatic aspects of unbalanced forces; NATO; military unification; economic aspects of security, air, land, and seapower.

Foreign Policy: Next Phase, the 1960s, by Thomas K. Finletter (Harper, $4). Incisive discussion and analysis of American position and policy proposals for the next critical decade.

Who Wants Disarmament? by Richard J. Barnet (Beacon Press, $3.50). A study of the disarmament debate revealing changing American and Soviet attitudes on the issues since 1946.

Germany Divided: The Legacy of the Nazi Era, by Terence Prittie (Little, Brown, $5.75). A study of German prosperity today exposing problems that smoulder under the surface.

UN: The First Fifteen Years, by Clark M. Eichelberger (Harper, $2.75). An informal appraisal of the UN's mission, successes, and failures during its fifteen years.

American Might and Soviet Myth, by Jameson G. Campaigne (Regnery, $3.95). The US is far superior to the Soviet Union in economic, military, and ideological power; our weakness is the failure of our nerve, writes the author.

The Edge of War, by James D. Atkinson (Regnery, $6). The Soviets have fused the words war and peace to create a perpetual conflict of civilization in all human endeavor, maintains Mr. Atkinson. Unless we muster all our resources and apply the determination needed to back up our policy, we will not survive. Foreword by Adm. Arleigh Burke, Chief of Naval Operations.

Kishi and Japan: The Search for the Sun, by Dan Kurzman (Obolensky, $5.95). The history of the conversion of a samurai and feudal Japan to a westernized democracy.

The Haphazard Years: How America Has Gone to War, by George C. Reinhardt and William R. Kintner (Doubleday, $4.50). A study of American war preparation over the past seventy years, characterized by the authors as "fumbling" in each case.

The Modern Law of Land Warfare, by Morris Greenspan (Univ. of Calif. Press, $10). A detailed, systematic study of land warfare today.

* * *

For the young adult, two new books probe the vistas of the aerospace frontier. Third in the popular Rutherford Montgomery's Kent Barstow Air Force adventure series is *Mission Intruder* (Duell, Sloan & Pearce, $3), a thriller which ranges from the desert flats surrounding the Flight Test Center at Edwards AFB to the skies above Alaska. Crack test pilot Capt. Kent Barstow has the job of halting Soviet bomber penetrations over the Arctic frontiers in the newest, fastest fighter under test—the F-113.

Time Magazine's Miami, Fla., bureau chief, William R. Shelton, has covered most of the significant events at Cape Canaveral since early 1958. From this knowledgeable background he writes the story of our rocket, missile, and space experimentation in *Countdown: The Story of Cape Canaveral* (Little, Brown, $3.50). The narrative covers the Cape's history, its development into a complex space launch platform today. Typical space probes and missile tests portray the men, the equipment, the mission and operation, and the downrange area with its island tracking sites.

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More than one million Americans are living proof. Remember . . . your contributions helped save many of these lives. Your continuing contributions are needed to help discover new cures and, ultimately, the prevention of cancer itself • Remember, too, if you delay seeing your physician, you drastically cut your chances of cure. Annual checkups are the best way of detecting cancer in time • Guard your family! Fight cancer with a checkup and a check.

AMERICAN CANCER SOCIETY

Now GUARANTEED Flight Pay Insurance!

An extra AFA benefit at no extra cost . . .

Now AFA Flight Pay Insurance is a better investment than ever, because it offers *guaranteed protection*, even against preexisting illnesses, after the first year's coverage.

There's no extra charge for this new, liberal provision and no change in the regular benefits of the policy—

- *Coverage for* both *illnesses and accidents.*
- *Payments for up to 24 months if your grounding is the result of an aviation accident — up to 12 months if for illness or ordinary accident.*

Remember, payment for a single 90-day grounding reimburses you for the whole cost of 10 years' protection.

NOTE:

All policies are dated on the last day of the month in which the application is postmarked, and protection against accidents begins as of that date; protection against groundings due to illnesses begins 30 days later. Of course, coverage cannot be immediately extended to include illnesses which existed prior to the time at which you insured your flight pay, but after 12 months you are fully covered against all illnesses.

To be eligible for protection, you must have passed your last annual physical . . . be presently in flying status . . . and be a member of the Air Force Association.

Most claims are routine. Where a difference of opinion exists, the Air Force Association has the right to request a review of medical records and other claim evidence by appropriate medical authorities—normally the office of the Surgeon General, USAF.

There are also some exclusions that affect your coverage under the Flight Pay Protection Plan. They are designed primarily to protect your investment in the Plan—restrictions that you'd normally expect, such as groundings due to insanity, court-martial, attempted suicide, etc. Here they are in detail:

EXCLUSIONS:

The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).
2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.
3. Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.
4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.
5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.
6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.
7. Mental or nervous disorders.
8. Alcohol, drugs, venereal disease, arrest, or confinement.
9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.
10. Suspension from flying for administrative reasons not due to injuries or disease, even though the Member may have been eligible for or was being reimbursed at the time of the administrative grounding because of a previously established disability.
11. Loss of life shall not be deemed as loss for purposes of this insurance.
12. Primary duty requiring parachute jumping.
13. Voluntary suspension from flying.
14. A disease or disability preexisting the effective date of coverage, or a recurrence of such a disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directive of the service concerned, *unless the Member was insured under the master policy issued to the Air Force Association for 12 continuous months immediately prior to the date disability (grounding) commenced.*

Underwritten by Mutual Benefit Health & Accident Association (Mutual of Omaha).

CHOOSE EITHER CONVENIENT PAYMENT PLAN. MAIL THE APPLICATION TODAY!

AFA FLIGHT PAY PROTECTION PLAN

AIR FORCE ASSOCIATION • MILLS BLDG. • WASHINGTON 6, D. C.

Send me my Flight Pay Protection Policy.

BILL ME FOR:

$_____ semiannual premium (1% of annual flight pay, plus $1 service charge)

$_____ for full payment of annual premium (2% of annual flight pay)

I ENCLOSE:

$_____ semiannual premium (1% of annual flight pay, plus $1 service charge). Bill me every 6 months

$_____ in full payment of annual premium (2% of annual flight pay)

This insurance is available for AFA Members only ☐ I am an AFA Member ☐ I enclose $6 for annual AFA membership

Rank (please print) Name Address

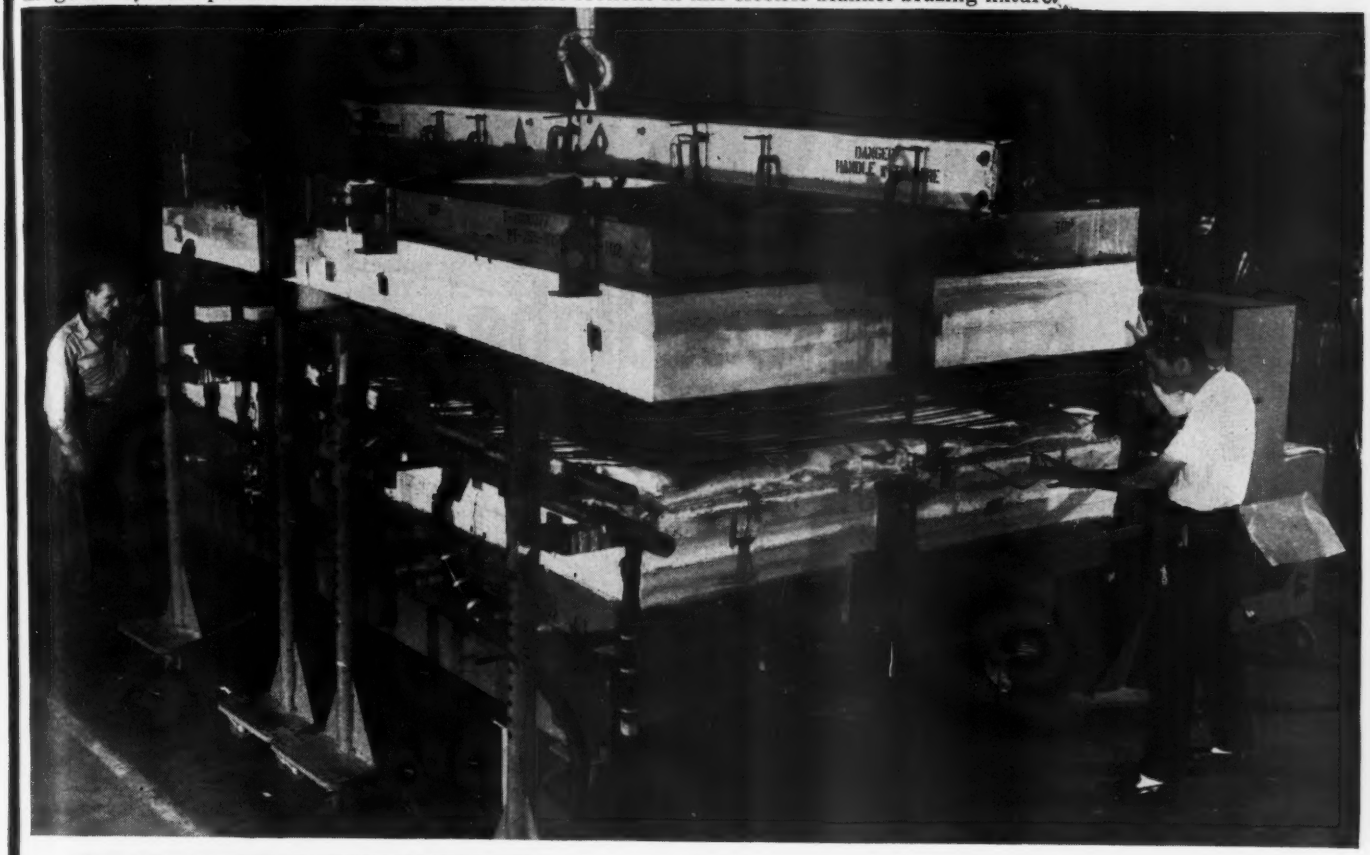
City Zone State $ Annual Flight Pay Years Service for pay purposes

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant Date

Underwritten by Mutual of Omaha 2-61

Large honeycomb panels are brazed between ceramic sections in this electric blanket brazing fixture.



Mach 3 Manufacturing

Making an aircraft skin tough enough to withstand the heat barrier

To cope with the heat barrier and cruise at speeds in excess of 2000 miles an hour, an aircraft needs a skin unlike that of any plane in existence. Traditional covering methods were out of the question.

To solve this problem, the engineers and scientists at the Los Angeles Division of North American Aviation carried on further experiments with the techniques of manufacturing stainless steel honeycomb. They found that by sandwiching this honeycomb between two sheets of steel, sometimes only six thousandths of an inch thick, structural sections could be obtained with excellent insulating characteristics and stiffness approaching a solid slab of steel, yet would be far lighter.

The problem of brazing these honeycomb panels to meet the oven-hot temperatures of Mach 3 speed required an intensive development program. In conjunction with NAA's team of subcontractors, experiments were made with many kinds of brazing methods. One in particular would give high-quality results, with economy. This method utilizes a ceramic form to hold a honeycomb panel at controlled heats of over 1625 degrees.

As a result of this advanced development in the art of making aircraft coverings, a plane can now have a skin so tough it is well able to withstand thermantic speeds.

This technological breakthrough will help sustain America's leadership in aircraft and make possible the supersonic manned weapon systems and commercial aircraft of the future. Because of metallurgical achievements in supersonic fabrication, the American Society of Metals gave North American its 1959 Advancement of Research Award.

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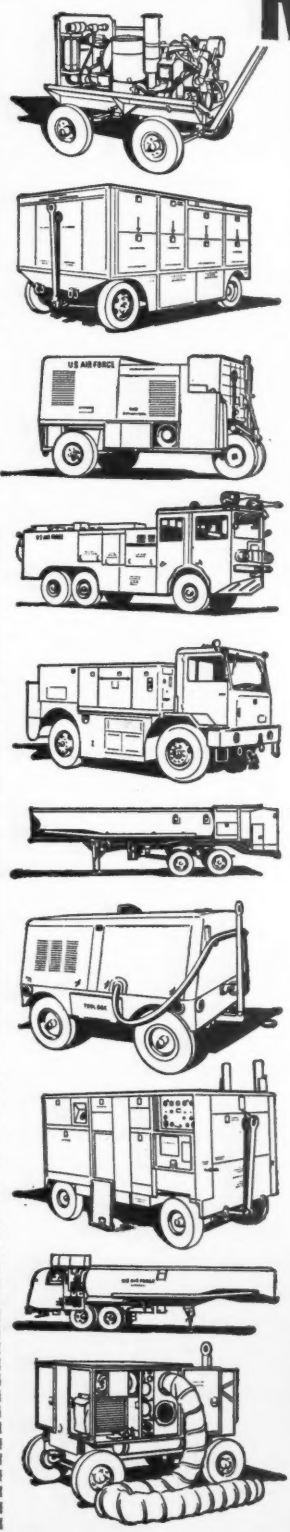

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Developed by Continental Motors, with the famous Continental air-cooled aircraft engines as their basis, these five Military Standard models [Mil. E-26248 (USAF)] range from 30 to 250 hp, combine compactness and light weight with ease of servicing and upkeep, and operate at any temperature from equatorial heat to polar cold. Of special interest and importance, as simplifying maintenance in the field, is the wide interchangeability of parts among the several Packettes, and between them and the models in the Continental aircraft engine line.

They're use-proved NOW in air conditioners, compressors, crash trucks, generators, test stands, refuelers, heaters, blowers, Rollagons, multi-purpose tugs and other applications. Experience is proving: IF THE APPLICATION FALLS WITHIN THEIR POWER RANGE, NO OTHER ENGINE WILL DO THE JOB SO WELL.

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AIRCRAFT ENGINE DIVISION

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INDEX TO ADVERTISERS

Aerojet-General Corp. ..... Cover 3
Aircraft Radio Corp. 110
AiResearch Mfg. Co., Div. Garrett Corp. 103
Alpha Corp. 92
American Airlines, Inc. 117
American Systems Inc. 28
American Telephone & Telegraph Corp. 4
Antelline, Fred F., Inc. 119
AVCO Corp. 81

Beech Aircraft Corp. 99
Bendix Radio Div., Bendix Aviation Corp. 70
Burroughs Corp. 100

California Technical Industries, Div. Textron, Inc. 116
Catalytic Construction Co. 34
Caterpillar Tractor Co., Defense Products Dept. 7
Cessna Aircraft Co. 10
Clifton Precision Products Co., Inc.. 91
Continental Motors Corp. 122
Convair, a Div. of General Dynamics Corp. ..... Cover 4

Delco Radio, Div. of General Motors Corp. 115
Douglas Aircraft Co., Inc. 77

Francis Aviation 119

General Electric Co., Flight Propulsion Div. .... 24 and 25
Gilfillan Bros. 18
Goodyear Tire & Rubber Co., Inc... 1

Hallicrafters Co., The 107
Hamilton Standard Div., United Aircraft Corp. .... 36 and 37
Hoffman Electronics Corp., Military Products Div. 82
Hughes Aircraft Co. ..... 78 and 79
Hydro-Aire, Inc. 21

Kaman Aircraft Corp. ..... Cover 2

Laboratory for Electronics 14
Lockheed Aircraft Corp., Georgia Div. 97
Los Angeles Div. of North American Aviation, Inc. .. 121

Magnavox Co., The, Government & Industrial Div. 47
Marquardt Corp. ..... 12 and 13
McDonnell Aircraft Corp. 58

Operations Evaluation Group 118

Pratt & Whitney Aircraft Div., United Aircraft Corp. 30

RCA Defense Electronic Products, Radio Corp. of America..... 2 and 3
Red Bank Division, General Products Dept., Bendix Corp. .. 11
Ryan Aeronautical Co. 85

Sierra Engineering Co. 27
Space Technology Laboratories, Inc. 88
Sperry 104
Stromberg-Carlson Co. 32
System Development Corp. 73

Texas Instruments Incorporated ..... 29, 31, 33, and 35

United Systems Corp. 69

Vertol Aircraft Corp. ..... 108 and 109
Vitro Laboratories, a Div. of Vitro Corp. of America 74

Westinghouse Electric Corp., Defense Products Group 8

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3. Longer Protection—to Age 65. As long as you are on active duty, you get protection to Age 65, provided your policy is purchased prior to Age 60.

4. Liberal Non-Medical Conversion. At Age 65—or at any time you leave the service before then—your insurance is fully convertible to any permanent plan of insurance then being offered by the Underwriter, United of Omaha, **regardless of your health at that time.** (Since the special benefits of this AFA Group Policy are available **only** to active duty personnel, this liberal conversion privilege is an important part of the policy for those leaving the service.)

5. Developed and Administered by the Air Force Association. Your own Association—which developed Flight Pay Insurance for rated personnel—has also developed and now administers this policy for your benefit, on a strictly non-profit basis. Current plans also call for annual refunds as soon as sufficient reserves have been established. The policy is underwritten and guaranteed by United of Omaha, one of the world's largest life insurance companies.

6. Your Choice of Convenient Payment Plans. Your premium of $10 per month may be paid either by monthly government allotment, or direct to AFA in convenient installments. See the Order Form below for details.

FOR ACTIVE-DUTY OFFICERS AND NCO'S (E-5 AND ABOVE)

SCHEDULE OF COVERAGE

Your Age	Amount of Insurance	
	On Flying Status	Not On Flying Status
20-24	$10,000	$20,000
25-29	11,000	20,000
30-34	12,500	20,000
35-39	13,000	20,000
40-44	13,500	17,500
45-49	12,500	13,500
50-54	10,000	10,000
55-59	10,000	10,000
60-64*	7,500*	7,500*

** Continuing benefits. Policy must be purchased prior to Age 60.*

Plus 50% Additional Indemnity for ALL Accidental Deaths

EXCLUSIONS—FOR YOUR PROTECTION

There are naturally a few exclusions which apply to your policy, and to keep the record straight, they are listed here in detail, as follows:

Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for 12 months. The Accidental Death Benefit shall not be effective if death results: (1) from injuries intentionally self-inflicted while sane or insane, or (2) from injuries sustained while committing a felony, or (3) either directly or indirectly from bodily or mental infirmity, or poisoning, or asphyxiation by carbon monoxide, or (4) during any period while the policy is in force under the waiver of premium provision of the master policy.

MAIL YOUR APPLICATION TO AFA TODAY!

Air Force Association Group Life Insurance
(UNDERWRITTEN BY UNITED OF OMAHA)

Rank (please print) Name

Address

City Zone State

Date of Birth

Beneficiary Relationship

This Insurance is available only to AFA members.

☐ I enclose $6 for annual AFA membership dues.

☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am on active duty, that to the best of my knowledge I am in good health, and that I have successfully passed an Annual Physical Examination within one year.

Signature of Applicant..... Date.....

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose $30 to cover the period necessary for my allotment to be processed.)

☐ Quarterly (I enclose $30)

☐ Semi-annually (I enclose $60)

☐ Annually (I enclose $120)

☐ I am currently on flying status.

☐ I am not currently on flying status.

Application must be accompanied by check or money order.

Send remittance to: INSURANCE DIVISION, AFA, MILLS BLDG., WASHINGTON 6, D. C.

This Is AFA

The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• To assist in obtaining and maintaining adequate airpower for national security and world peace. • To keep the AFA members and the public abreast of developments in the field of aviation. • To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

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